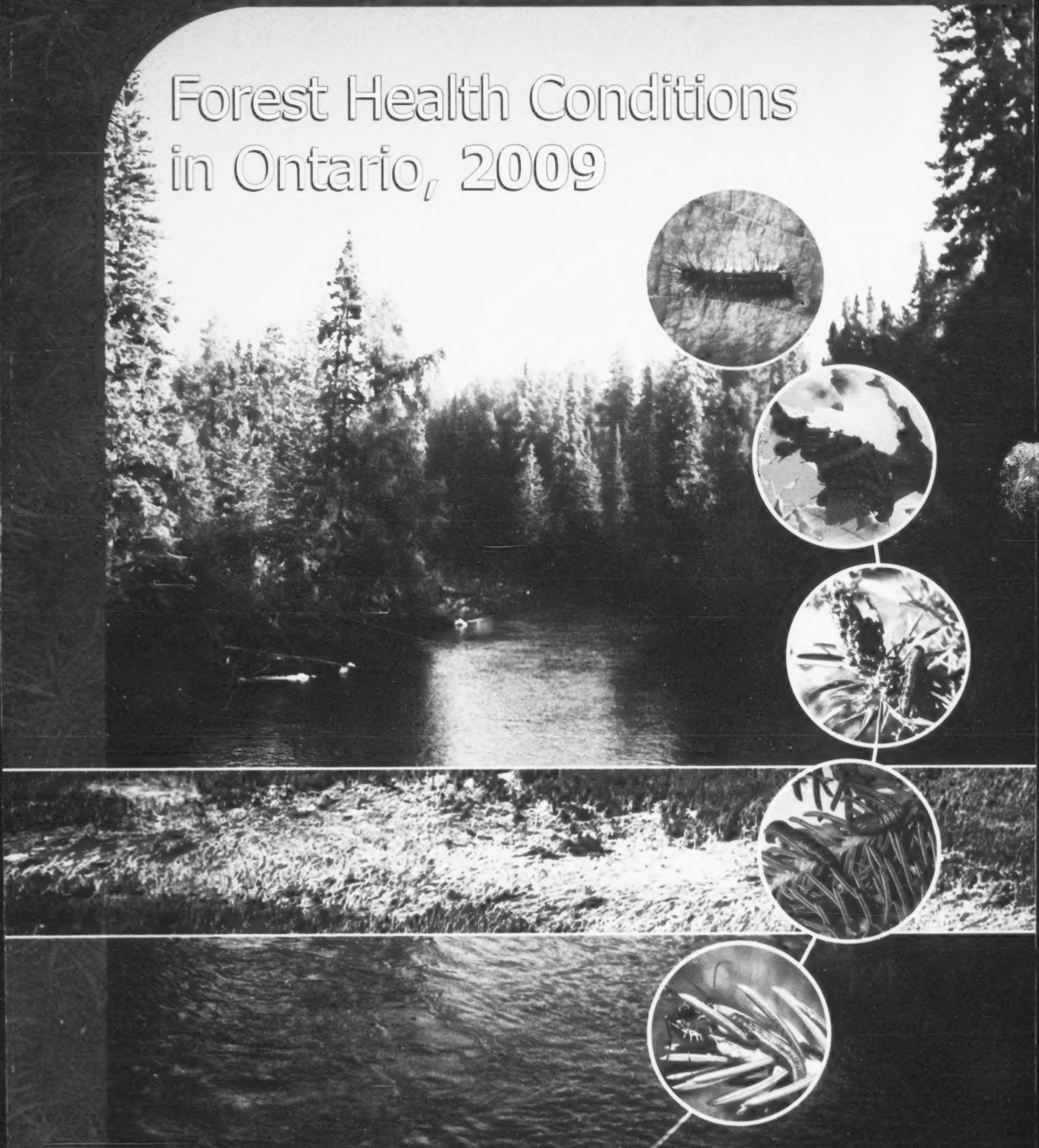
Forest Health Conditions in Ontario, 2009



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Forest Health Conditions in Ontario, **2009**

Edited by:

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For more information on forest health in Ontario visit the Ontario Ministry of Natural Resources website: **www.ontario.ca/foresthealth**

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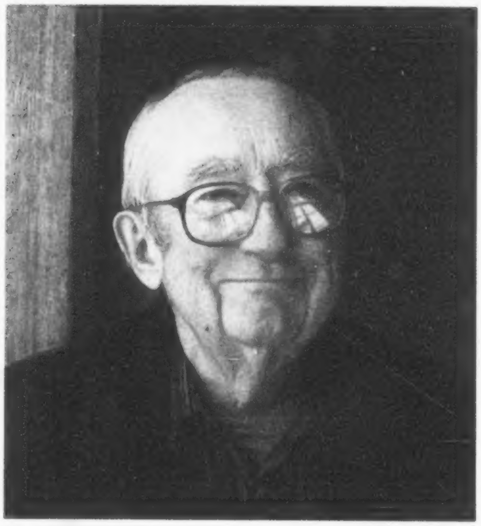
Front Cover Photos: *Circular photos top to bottom – Gypsy moth (P. Hodge), Greenstriped mapleworm (M. Francis), Jack pine budworm, Spruce budworm (M. Francis), Yellowheaded spruce sawfly and parsitic wasp (D. Rowlinson).* ***Background:*** *Scenic picture from Chapleau (D. Rowlinson).* ***Banner:*** *Tornado damage in Northwest Region (B. Smith).*

Forest Health Conditions in Ontario, **2009**

DEDICATION



This report is dedicated to Dr. Gordon M. Howse (retired), in recognition of his many years of unwavering contribution to forest pest management, and forest health monitoring and surveys in Ontario and Canada.

Dr. Howse was born in Perth, Ontario in 1936. He received his B.Sc.F. from the University of New Brunswick in 1962, M.Sc. in entomology from the University of Maine in 1964 and a Ph.D. in forest entomology from Oregon State University in 1973. He joined the Canadian Forest Service in March, 1968 as a Research Officer with the Forest Insect and Disease Survey (FIDS) Unit at Great Lakes Forestry Centre (GLFC) in Sault Ste. Marie, Ontario, and was later promoted to Research Scientist after receiving his Ph.D. He was named Head, FIDS Unit, November 1, 1977. Dr. Howse was appointed adjunct professor of forest entomology, Faculty of Forestry, University of Toronto from 1984 to 1994 and adjunct professor of forest entomology at the University of Guelph in 1984 for two years. From 1987 to 1989, he supported the Ontario Ministry of Natural Resources by providing technical and scientific advice and information to OMNR's legal counsel, staff and witnesses, in presenting its case (MNR's) on the use of pest control products in forest management at the Timber Class Environmental Assessment hearings in Thunder Bay. In 1996, he was named Leader, Forest Health Monitoring Unit, CFS, GLFC. Dr. Howse acted as scientific advisor to numerous OMNR pest management programs. Until his retirement, Dr. Howse authored or co-authored 330 publications or reports including contributions to three books. Dr. Howse partially retired April 23, 2003 after 36 1/2 years of service with the CFS since 1960 but continued to work on special projects on a 30% paid basis. Currently, Dr. Howse has guest worker status at GLFC.

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ACKNOWLEDGEMENTS

The forest health monitoring program in Ontario is conducted under the Memorandum of Agreement in Forest Health Monitoring between the Ontario Ministry of Natural Resources (OMNR) and the Canadian Forest Service (CFS) of Natural Resources Canada. The annual field program is designed and led by Taylor Scarr[1] and Krista Ryall[2] on behalf of the two organizations. The province is divided into 12 work areas (Figure 1.1), with OMNR field technicians conducting the surveys and monitoring. Starting in 2009, Dan Rowlinson[1] coordinated the delivery of the field program.

Field staff conduct aerial surveys, perform ground checks to verify aerial surveys, assess ground plots, trap or monitor insects, collect insect and disease samples, and participate in research and monitoring programs. They also provide extension services to forest managers and landowners, and make presentations on local conditions at various workshops and seminars.

In 2009, the OMNR-CFS field staff were:

- Will Byman[1] (Sudbury-Parry Sound)
- Eric Cleland[1] (Aylmer-Guelph)
- Ed Czerwinski[1] (Peterborough-Bancroft)
- Mike Francis[1] (Sault Ste. Marie)
- Pat Hodge[1] (Midhurst-Aurora)
- Johanne Jamieson[1] (North Bay-Kirkland Lake)
- LeeAnne Malley[1] (Thunder Bay-Nipigon)
- Susan McGowan[1](Algonquin Park-Pembroke-Kemptville)
- Dan Rowlinson[1] (Wawa-Chapleau)
- Lincoln Rowlinson[1] (Kenora-Fort Frances)
- Barry Smith[2] (Dryden-Red Lake-Sioux Lookout)

Three new field staff were also hired and mentored through the season including:

- Aspen Zeppa[1] (Timmins-Hearst-Cochrane)
- Tyler Straight[1] (Kenora-Fort Frances)
- Steven Young[1] (Dryden-Red Lake-Sioux Lookout)

Al Keizer[2], Hugh Evans[2], Barry Smith[2], and Wayne Ingram[1] provided mentoring of OMNR field staff as well as participating in CFS research projects.

Since 2005, a special survey has been conducted with support from the Canadian Food Inspection Agency for European wood wasp, Sirex noctilio. For 2009, Sirex noctilio field collections were done by Cheryl Widdifield[1] and Mathieu Pigeau[1] with screening and sample preparation done by Sarah Drabble[1] and Madeline Alyea[1]. Thanks to Al Foley[1] for the use of the Ontario Tree Seed Plant as a field base. Peter de Groot[2] and Taylor Scarr[1] provided scientific leadership to the Sirex noctilio survey, with technical support from Reg Nott[2]. Kathryn Nystrom[2] performed taxonomic identification for Sirex noctilio and related species that were collected.

Data management and GIS support was provided by Ron Fournier[2] and Larry Watkins[1]; all forest disturbance maps for this report were compiled by Don Higgs[1]. Insect identification was provided by Kathryn Nystrom[2] with assistance from Isabelle Ochoa[2]; fungal identification was provided by Sylvia Greifenhagen[1]. Program pathology and mycology guidance and expertise were provided by Richard Wilson[1]. Program entomology guidance and expertise were provided by Taylor Scarr[1]. Research projects were designed and led by Krista Ryall[2]. All photos used in this report are credited to individual forest health field staff.

Appreciation is extended to Tyler Straight[1] who helped finish compiling this report and preparing it for publication.

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Forest Health Monitoring in Ontario, 2009

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SECTION 1

PROGRAM OVERVIEW

Introduction

Forest health monitoring in Ontario is conducted as a partnership between the Ontario Ministry of Natural Resources (OMNR) and Natural Resources Canada-Canadian Forest Service (CFS). This federal-provincial collaboration began in the 1930s, and has been formalized under a series of memoranda of understanding.

The forest health partnership has evolved over the years as the mandates of the two organizations have changed. While the CFS and its predecessors have historically conducted the bulk of the field work, since 1998 the two organizations have combined their field resources to deliver a joint program that integrates forest health monitoring and research.

In 2009, OMNR field staff conducted most of the field monitoring, with one CFS technician based out of Sioux Lookout in north-western Ontario. This transition to having OMNR staff undertake the field program was facilitated by CFS technicians who provided field mentoring and training of several newly-hired OMNR staff. The CFS also led various research projects for which OMNR provided additional field support.

Also beginning in 2009, identification of the forest tree disease field samples collected by the technical staff was performed by OMNR's Ontario Forest Research Institute. Insect diagnostics continued to be done by the CFS.

Forest Health Monitoring

Recording and reporting of forest health conditions in Ontario includes monitoring the occurrence of both native and invasive biotic (e.g., insect, disease), and abiotic (e.g., severe weather conditions) disturbances and events. The monitoring program consists of permanent sample plots, temporary sample plots, plantation surveys, and aerial mapping of major forest disturbances. All forest areas are included: provincial Crown land, federal lands, First Nations territories, parks, and private land and urban areas. Ad hoc sampling of insects and diseases is also done to maintain a database of their occurrence in the province.

Insect samples are collected and sent to the CFS, Great Lakes Forestry Centre for identification of causal agents. Disease samples are sent to the Ontario Forest Research Institute. Throughout the field season, forest health updates are distributed to client groups including forest industry, government, landowners and other interested stakeholders.

Results of the program are presented at the Annual Forest Health Review. The results of the monitoring program are used to report on the health of Ontario's forests and the major factors affecting forest health. The information is used to develop forest pest management and forest management policy, for planning pest management programs, and prioritizing and designing research projects. The information is also used to support other initiatives such as criteria and indicators of forest sustainability, biodiversity objectives, invasive species strategies and programs, and climate change programs.

2009 Forest Health Conditions Report

The *Forest Health Conditions Report* presents the results of annual surveys and monitoring conducted by the forest health monitoring partnership in Ontario. It is published by the OMNR as part of the partnership between OMNR and the CFS. The report is a continuation of a series of annual Forest Health Monitoring reports produced by the CFS from 1995 to 2003, which was preceded by annual reports of the Forest Insect and Disease Survey, also produced by the CFS.

The report is divided into chapters of major forest disturbances, invasive species, and regional reports for each of OMNR's three administrative regions (Figure 1.1). Major forest disturbances are insect, disease, or weather events that affect very large areas, are not specific to a region (e.g. storm events), or currently or historically have affected more than one region. This chapter typically describes events that are of provincial level significance. Invasive species are not native to Ontario, and have the potential or proven ability for deleterious effects on forest health, tree health, ecosystem functioning, or social or economic values. The chapters for each region report on forest health conditions for that region, other than for major forest disturbances and invasive species.

The insects and diseases are presented in alphabetical order by Latin name within each chapter. A species index is included to help readers search for an individual species. The report uses common names, except where none exists. For each chapter, the Latin name and scientific authority are also given the first time a species is mentioned in that chapter. Thereafter the insect, disease, or plant is referred to by its common name within that chapter.

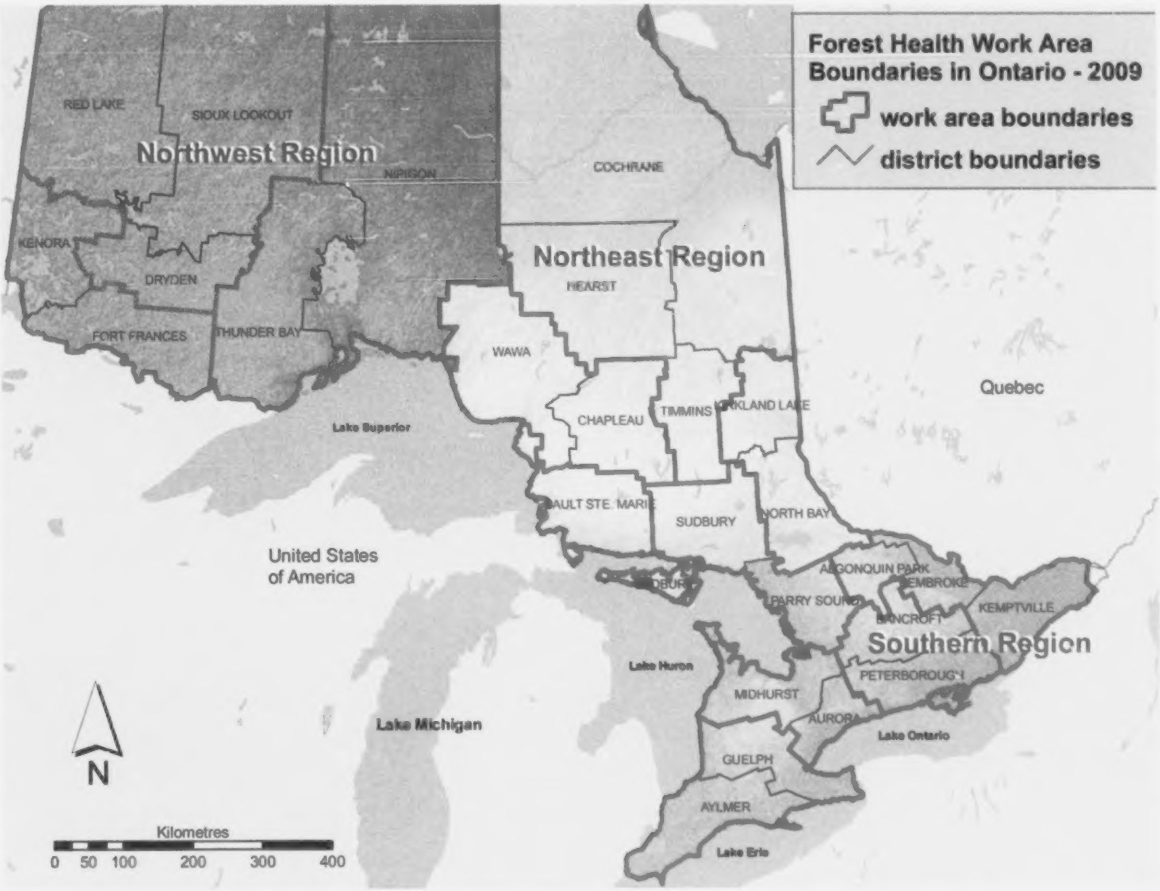

Forest Health Work Area Boundaries in Ontario - 2009
work area boundaries
district boundaries
RED LAKE
SIOUX LOOKOUT
Northwest Region
NIPIGON
COCHRANE
KENORA
DRYDEN
FORT FRANCES
THUNDER BAY
Northeast Region
HEARST
WAWA
CHAPLEAU
TIMMINS
KIRKLAND LAKE
Quebec
Lake Superior
SAULT STE. MARIE
SUDBURY
NORTH BAY
United States of America
ALGONQUIN PARK
PEMBROKE
SUDBURY
PARRY SOUND
BANCROFT
KEMPTVILLE
Southern Region
PETERBOROUGH
Lake Huron
MIDHURST
AURORA
Lake Michigan
Lake Ontario
GUELPH
AYLMER
Lake Erie
N
Kilometres
0
50
100
200
300
400

Figure 1.1 Forest health work areas and Ontario Ministry of Natural Resources administrative regions and districts.

2009 SUMMARY OF EVENTS

Weather events

Weather was a dominant factor affecting forest health conditions in 2009. Most of the province experienced cool wet weather during the growing season. This favoured several fungi, resulting in foliar diseases being common on both conifers and hardwoods. This weather also favoured tree growth, while at the same time slowing down insect development. Insect defoliation was often difficult to detect during aerial mapping. In some cases, the defoliation was not as severe as would be expected, or the coloration of the damage was not as visible because the affected foliage did not dry out as readily. For some foliage feeders such as jack pine and spruce budworms, rain events washed off the damaged needles that are typically used by the aerial observer for detecting defoliation.

Not only were foliar diseases more common, but the fungus *Entomophaga maimaiga* benefited from the cool wet weather and wiped out the gypsy moth (*Lymantria dispar* L.) population across southern Ontario.

Several extreme weather events in 2009 resulted in damage to the forest as well as to buildings and infrastructure. Pine plantations (red pine (*Pinus resinosa* Ait.), white pine (*P. strobus* L.), and Scots pine (*P. sylvestris* L.)) between Penetanguishene and Barrie were damaged by a late winter heavy snowfall that affected 730 ha. Tree tops were broken off, trees were bent over or flattened, and many were snapped off at the main bole. Similar damage occurred in mixedwood stands in northwestern Ontario around Terrace Bay where a winter ice storm caused 9,808 ha of flattened and bent trees.

Despite the cool weather pattern of 2009, on July 9 five tornados touched down in the northwest. Some 7,270 ha of forest were flattened. Two men were killed when their fishing cabin on the shore of Lac Seul was picked up by the tornado and dropped into the lake. Significant media coverage was given to an August 20 tornado that damaged 677 ha of forests south of Owen Sound, and affected urban areas. Another tornado also touched down on the south shore of Lake Nipissing.

Insect infestations

Since 2004, jack pine budworm (*Choristoneura pinus pinus* Free.) has been undergoing a population outbreak in parts of the province. In Northwest Region, the outbreak has followed a typical pattern of 2-3 years of moderate-to-severe in a given area, followed by a local population collapse. This collapse has been followed by an increasing population in nearby areas as the outbreak has progressed from its initial start near Fort Frances, moving to Kenora, Dryden, and Atikokan, and then to Red Lake and Sioux Lookout.

In Northeast Region, the jack pine budworm outbreak has been much slower to take off, even though defoliation was observed there first in 2004. Populations have remained relatively low and restricted in area. In 2008 though, defoliation in the junction area of Highways 144 and 560 south of Gogama affected high value jack pine stands and resulted in widespread tree mortality.

In Southern Region, the jack pine budworm outbreak has been quite localized, although some severe defoliation has occurred in pockets such as in Algonquin Park and Bonnechere Provincial Park.

In 2009, the jack pine budworm outbreak continued in all regions, increasing from 168,453 ha in 2008, to 205,701 ha of moderate-to-severe defoliation. While there was an overall increase in affected area, many areas defoliated in 2008 were not defoliated in 2009. The 2009 defoliation is well below the peak of 740,116 ha in 2006. Overwintering larval surveys done in fall 2009 suggest some pockets of defoliation can be expected in 2010. Some of the highest populations are expected to occur in southern Ontario, near Parry Sound and Bonnechere Provincial Park. Overall though, the jack pine budworm outbreak is expected to decline in 2010.

Spruce budworm (*Choristoneura fumiferana* Clem.) remained at low levels throughout much of Ontario in 2009, compared to its peak of over 18 million ha in 1981. The one exception is a multiple-year outbreak that has persisted between Sudbury and North Bay, where 291,592 ha were defoliated in 2009. Tree mortality continued in this area, increasing by 180,031 ha in 2009.

Forest tent caterpillar (*Malacosoma disstria* Hbn.) has cyclical outbreaks in Ontario, occurring approximately every 10-12 years. This insect is currently at endemic levels, with a new outbreak expected to begin in the next 2-3 years. Nonetheless, in 2009 forest tent caterpillar did defoliate hardwoods in an area totalling 8,912 ha north of Kingston. This infestation is noteworthy in that forest tent caterpillar defoliation has not been previously recorded this far south in Ontario.

Several other insects caused localized defoliation or damage in various parts of Ontario. These included Bruce spanworm (*Operophtera bruceata* Hlst.) (26,146 ha), large aspen tortrix (*Choristoneura conflictana* Wlk.) (88,862 ha), and white spotted sawyer (*Monochamus scutellatus* Say) (16,874 ha).

Foliar diseases

The cool wet weather of 2009 resulted in such a proliferation of leaf diseases that they could be mapped from the air. Ink-spot of aspen (*Ciborinia whetzelli* (Seaver) Seaver) was widely encountered in Northwest Region, where 1,838 ha of leaf browning were mapped in several pockets from Red Lake to Fort Frances and Sioux Lookout. Needle cast of red pine (*Lophodermium seditiosum* Minter, Staley, and Miller) occurred on 196 ha near Powassan, south of North Bay. Brown spot needle blight (*Mycosphaerella dearnessii* M.E. Barr) affected 111 ha of pines near Midland. White pine browning, for which no cause has been identified, was common especially in the northwest. While the number of hectares affected may not have been large, these events were unusual in that they were common enough that they could be mapped from the air.

Tree decline

Aspen decline and mortality was widespread in Northwest Region, affecting 3,803,807 ha from Fort Frances to Red Lake and Geraldton. The cause of this decline is not yet known, and will be investigated in 2010.

Ash decline continued in southern Ontario, independent of emerald ash borer (*Agrilus planipennis* Fairmaire). In total, 3,602 ha of ash decline were aerially mapped east of the area where emerald ash borer is causing tree decline and mortality. This ash decline likely resulted from drought or other weather factors such as winter temperatures.

Invasive alien species surveys

Surveys for several invasive alien species continued in 2009. With financial support from the Canadian Food Inspection Agency (CFIA), a delineation survey was conducted in northwest and northeast Ontario for European woodwasp (*Sirex noctilio* F.). As in 2008, no new finds of this insect were made in 2009.

Similarly, surveys in the Toronto and Vaughan by municipal staff under the direction of the CFIA and with guidance from the CFS did not find any trees infested by Asian long-horned beetle (*Anoplophora glabripennis* Motschulsky). This marks the second year of no new finds for this insect, indicating that the potential remains high for complete eradication.

In contrast, emerald ash borer continued to spread and cause tree mortality. New infestations were found in Welland, Pickering, and Hamilton. Tree mortality was aerially mapped in numerous pockets from Grand Bend south to Norfolk County.

The invasive Asian plant kudzu (*Pueparia montana* (Lour.) Merr. var. *lobata*) has been a serious terrestrial invasive in the U.S. for decades. In 2009 it was found for the first time in Canada, infesting an area 120 m by 30 m along the Lake Erie shoreline near Leamington. The infestation completely covered the ground in the affected area and is spreading into an adjacent soybean field.

Insect pest management programs

Two insect pest management programs were conducted by OMNR in 2009. A jack pine budworm aerial spray program was conducted in north western and north eastern Ontario, and a pine shoot beetle (*Tomicus piniperda*(L.)) containment program was carried out in the northeast part of the province.

In the jack pine budworm program, the bacterial insecticide B.t.k. (Foray 76B) was applied at 1.5L/ha to 22,832 ha of jack pine stands near Gogama and to 58,146 ha near Red Lake. An efficacy assessment confirmed that the foliage protection program was successful in meeting its objective of keeping defoliation below 40% in 40+ year old jack pine stands.

The containment program for the pine shoot beetle from Europe was continued in 2009, with 25 sites along the leading edge of the infestation. Popuiation estimates from the bait logs, coupled with fall visual surveys for shoot attack, indicate the program has been successful in keeping the populations low with very few beetles (< 10) found at each site. Lindgren funnel trapping and visual surveys in 2009 and in previous years have not found pine shoot beetle north of this leading edge, indicating the insect remains contained to the south.

Forest Health Research Projects

Several research and health monitoring projects were undertaken in 2009 with the support of forest health field staff. Results of these projects are published as appropriate by the lead scientist, and are beyond the scope of this report. These projects included:

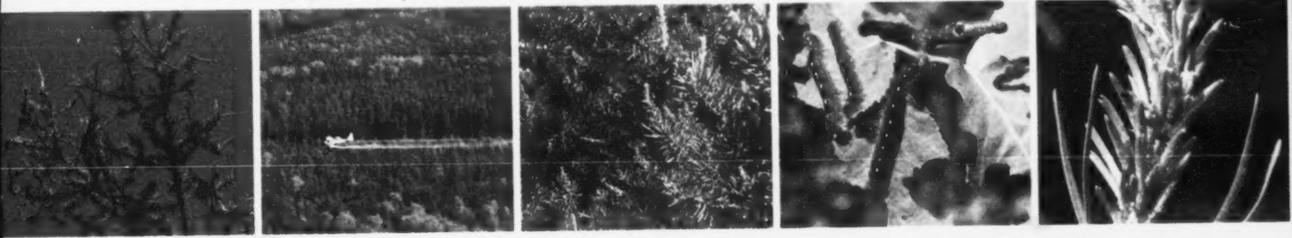
- in partnership with CFS-Northern Forestry Centre, annual monitoring of the CIPHA (climate change impacts on the productivity and health of aspen) plots in northern Ontario.
- development of detection methods for emerald ash borer.
- testing of a detection method for European oak borer (*Agrilus sulcicollis* Lacordaire).
- development of DNA methodology for identifying butternut trees (*Juglans cinerea* L.) resistant to butternut canker.
- training of tree health assessors for identifying butternut trees and providing a prognosis for their survival relative to infection by butternut canker (*Sirococcus clavigignenti-juglandacearum* V.M.G. Nair, Kostichka & Kuntz).
- efficacy testing of gypsy moth virus product Gypchek for control of gypsy moth.

Major Forest Disturbances

M. Francis[1], W. Byman[1], J. Jamieson[1], L. Rowlinson[1],
D. Rowlinson[1], P. Hodge[1], and S. Young[1]

[1] *Ontario Ministry of Natural Resources, Forest Management Branch, Forest Health & Silviculture Section, Sault Ste. Marie*

SECTION 2



FOREST INSECTS

Large aspen tortrix, *Choristoneura conflictana* (Wlk.)

The large aspen tortrix is a significant defoliator of trembling aspen (*Populus tremuloides* Michx.), second only to the forest tent caterpillar (*Malacosoma disstria* Hbn.). This insect feeds primarily on trembling aspen but also willow (*Salix* spp.), poplar (*Populus* spp.), cherry (*Prunus* spp.), and alder (*Alnus* spp.) (Figure 2.1). During an outbreak, tree crowns will appear thin and ragged as the result of the larvae folding and webbing the foliage.

In 2009, the large aspen tortrix defoliated 88,862 ha in the province (Figure 2.2). Almost all of this defoliation was in Northeast Region; a small amount was observed in Southern Region. No defoliation was recorded in Northwest Region.

In Northeast Region, large aspen tortrix defoliation has more than quadrupled in size from 21,681 ha in 2008 to 88,743 ha in 2009 (Table 2.1). Most of this increase in area defoliated occurred in Sault Ste. Marie and Sudbury districts, whereas there was a significant decrease in defoliation in North Bay district from 2008.

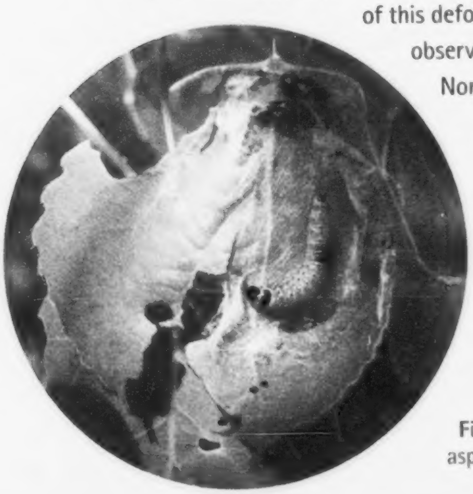


Figure 2.1 Large aspen tortrix larva feeding on trembling aspen in Sault Ste. Marie District (photo by M. Francis).

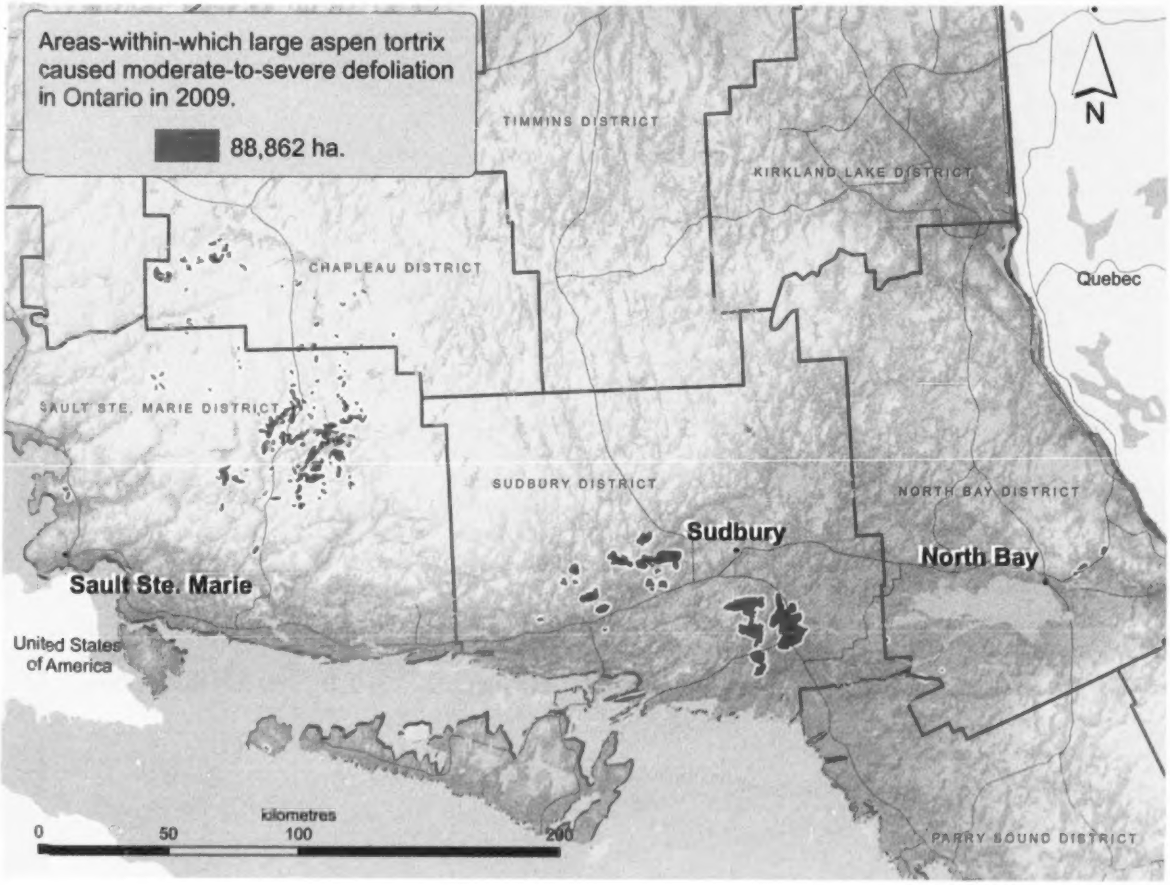

Areas-within-which large aspen tortrix caused moderate-to-severe defoliation in Ontario in 2009.
■ 88,862 ha.
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
N
Quebec
CHAPLEAU DISTRICT
SAULT STE. MARIE DISTRICT
SUDBURY DISTRICT
NORTH BAY DISTRICT
Sudbury
North Bay
Sault Ste. Marie
United States of America
kilometres
0
50
100
200
PARRY SOUND DISTRICT

Figure 2.2 Areas-within-which large aspen tortrix caused moderate-to-severe defoliation in Ontario in 2009.

Table 2.1 Gross area of moderate-to-severe defoliation by large aspen tortrix in Ontario, 2005-2009

Region	**Area of Defoliation (ha)**				
District	**2005**	**2006**	**2007**	**2008**	**2009**
Northwest					
Kenora	0	23,681	47,483	42,586	0
Red Lake	0	1,076	31,167	0	0
Sub total	0	24,757	78,650	42,586	0
Northeast					
North Bay	0	0	0	10,606	1,032
Sault Ste. Marie	0	0	0	11,075	34,293
Sudbury	0	0	0	0	46,092
Chapleau	0	0	0	0	7,326
Timmins	0	0	0	0	0
Sub Total	0	0	0	21,681	88,743
Southern					
Bancroft	3,997	0	0	0	0
Parry Sound	2,364	5,937	3,297	0	119
Pembroke	1,412	0	0	0	0
Sub total	7,773	5,937	3,297	0	0
Provincial total	**7,773**	**30,694**	**81,947**	**64,267**	**88,862**

In Sudbury District, large aspen tortrix defoliation erupted from no defoliation in 2008 to 46,092 ha in 2009. The majority of the defoliation was in the central and southwestern portions of the district. In the central portion of the district, moderate-to-severe defoliation was aerially mapped between Agnew and Windy lakes in Totten, Trill and Cascaden townships. In the southwestern portion of the district aspen defoliation was observed southwest of Nepewassi Lake in the townships of Burwash, Tilton, Halifax, Laura, Servios, Waldie, Struthers and Cox.

In Sault Ste. Marie District, ground surveys in mid-June detected a pocket of large aspen tortrix defoliation near Aubrey Falls. Aerial surveys conducted the following month revealed that moderate-to-severe defoliation of trembling aspen by this pest was much more extensive than defoliation levels that had been observed from the ground. A total of 34,293 ha of defoliation was aerially mapped in the northeastern portion of the district. The majority of damage was recorded south of Ranger Lake (Snow and Cuthbertson townships) and in the Rocky Island Lake area. Smaller pockets were scattered north of this area up into Chapleau District.

In Chapleau District, moderate-to-severe large aspen tortrix defoliation of trembling aspen was observed in the southern portion of the district during aerial surveys in mid-July. Defoliation was recorded from the south side of Engstrom Township extending northeast to include Fitzsimmons, Bordeleau, Cull, Green and Jeffries townships. This concentrated area, approximately 30 kilometers southwest of Chapleau totaling 7,326 ha in area, appears to be an extension of the larger more contiguous area of defoliation occurring in Sault Ste. Marie District this season.

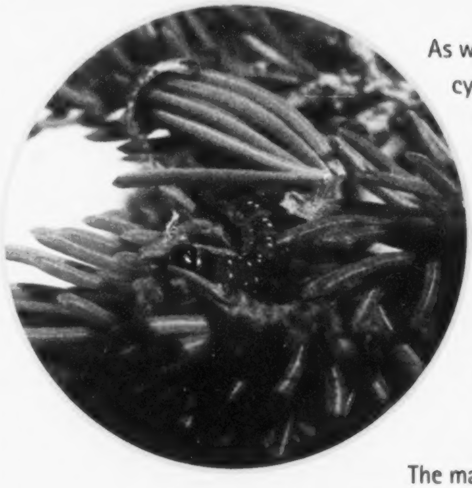
In North Bay District, small pockets of large aspen tortrix defoliation were mapped reaching a total area of 1,0302 ha. This insect caused defoliation in stands along Hwy. 63 near the community of Feronia, just east of North Bay, and the town of Balsam Creek in Phelps Township. Moderate-to-severe defoliation of aspen stands was also mapped along the north side of the Memesagamesing River in McConkey Township and in a small pocket in North Monetville.

In Southern Region, Parry Sound was the only district to have defoliation which could be aerially mapped in 2009. A small area of 119 ha was defoliated south of the west arm of Lake Nipissing along the French River.

No defoliation was recorded in 2009 in Northwest Region. In previous years an outbreak population of large aspen tortrix was established in the northwest that defoliated 24,757 ha in 2006, 78,650 ha in 2007 and 42,586 ha in 2008. It appears that the outbreak population has collapsed in Northwest Region.

Spruce budworm, *Choristoneura fumiferana* (Clem.)

Spruce budworm is one of the most destructive forest insects in North America and continues to cause moderate-to-severe defoliation of balsam fir (*Abies balsamea* (L.) Mill.), white spruce (*Picea glauca* (Moench) Voss) and black spruce (*Picea mariana* (Mill.) BSP) in Northeast and Southern regions of Ontario (Figure 2.3).



As with many forest insects, spruce budworm outbreaks are cyclical and linked to overmature stands of spruce and balsam fir. Spruce budworm populations and associated defoliation within Ontario over the past decade peaked in 2007 with a significant decrease in defoliation beginning in 2008 (Figure 2.4). This trend continued in 2009 when the lowest total defoliated area (291,592 ha) was recorded for the province within the past five years.

Figure 2.3 Spruce budworm larvae feeding on white spruce in northeastern Ontario (photo by W. Byman).

The majority of spruce budworm defoliation was recorded in Northeast Region with small pockets observed in Southern Region (Figure 2.5). For the fourth consecutive year there was no defoliation mapped in Northwest Region (Table 2.2).

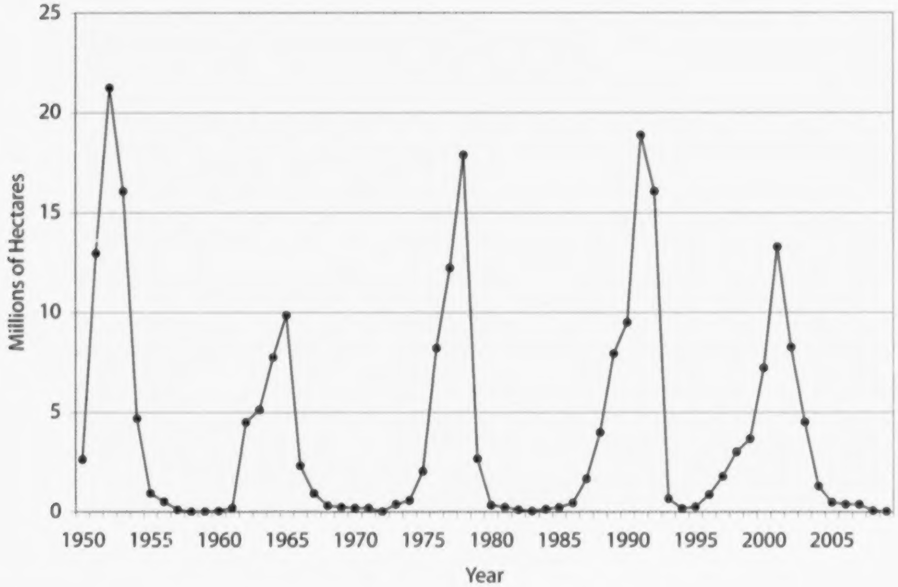


Figure 2.4 Spruce budworm moderate-to-severe defoliation in Ontario, 1950-2009.

Overall in 2009, the total area affected by spruce budworm (Figure 2.6) in Northeast Region decreased from 414,177 ha in 2008 to 290,466 ha, with defoliation in North Bay, Sudbury and Sault Ste. Marie districts.

The spruce budworm infestation in North Bay District decreased significantly in 2009 with 164,926 ha affected, almost half of the total defoliation mapped in 2008. The largest portion of defoliation was mapped on the west side of Hwy. 11 stretching from Latchford in Kirkland Lake District, south to Herridge Lake in North Bay District and to the west along Lake Temagami. A smaller portion of defoliation was mapped just east of Temagami. There were two other large areas mapped south of Marten River along Hwy. 11, and just north of Sturgeon Falls across Hwy. 64 to Bastedo Township.

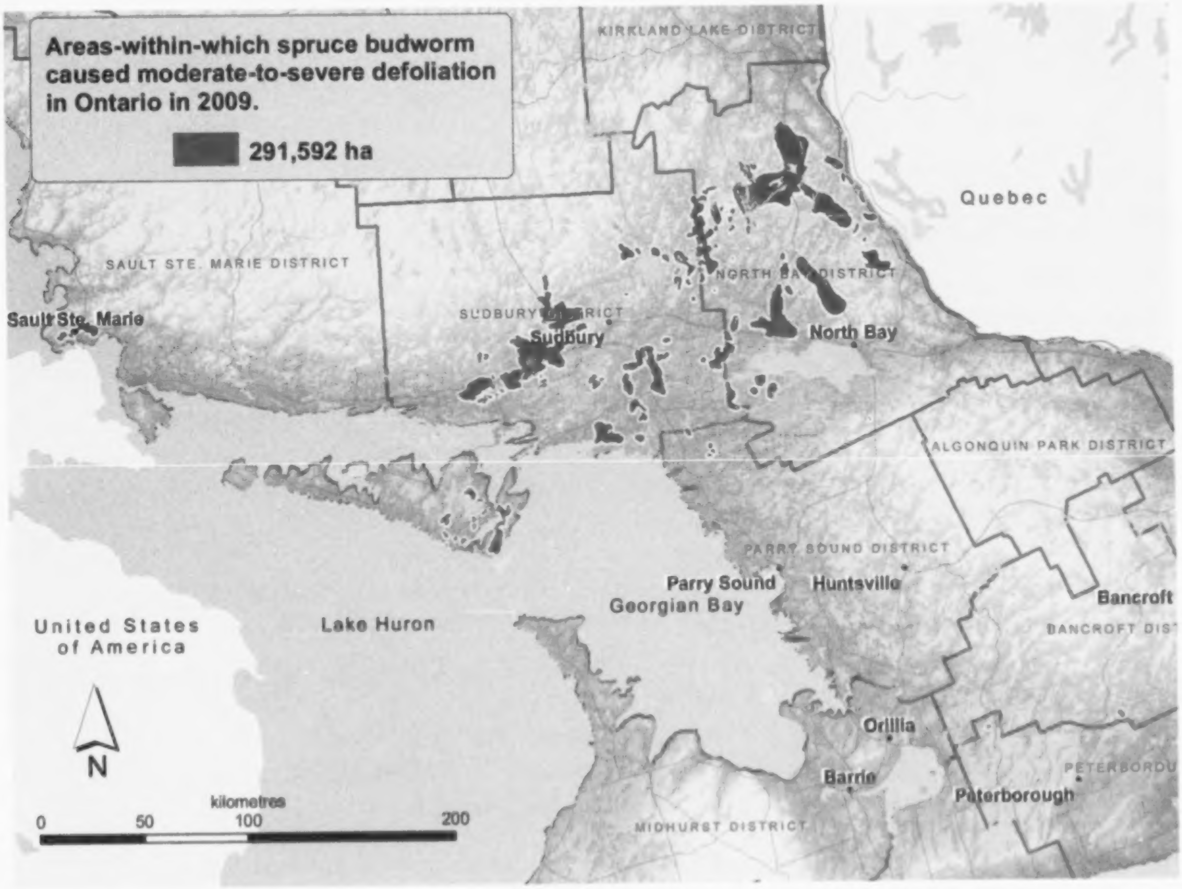

Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario in 2009.
291,592 ha
KIRKLAND LAKE DISTRICT
Quebec
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
SUDBURY DISTRICT
Sudbury
NORTH BAY DISTRICT
North Bay
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
Parry Sound
Huntsville
Georgian Bay
Bancroft
BANCROFT DIS
United States of America
Lake Huron
Orillia
Barrie
Peterborough
PETERBORDU
MIDHURST DISTRICT
N
kilometres
0
50
100
200

Figure 2.5 Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario in 2009.

Table 2.2 Gross area of moderate-to-severe defoliation caused by spruce budworm in Ontario, 2005-2009.

Region District	Area of Defoliation (ha) 2005	2006	2007	2008	2009
Northwest					
Kenora	209	0	0	0	0
Sub total	209	0	0	0	0
Northeast					
North Bay	250,936	690,731	714,358	306,069	164,926
Sault Ste. Marie	302	3,250	7,405	5,191	4,249
Sudbury	47,768	72,739	111,380	102,917	121,291
Sub total	299,006	766,720	833,143	414,177	290,466
Southern					
Algonquin	1,099	4,244	1,994	0	0
Bancroft	0	0	0	0	381
Kemptville	9,238	6,341	4,469	0	0
Midhurst	0	0	0	47	0
Parry Sound	0	2,796	2,217	4,121	644
Pembroke	27,889	17,105	7,222	303	0
Peterborough	44	0	0	81	101
Sub total	38,270	30,486	15,902	4,552	1,126
Provincial Total	**337,485**	**797,206**	**849,045**	**418,729**	**291,592**

Sudbury District was the only district that experienced a slight increase in area defoliated by spruce budworm. The chronic spruce budworm population here continues to expand across the district moving westerly and filling in areas previously undefoliated in recent years. In 2009, moderate-to-severe white spruce and balsam fir defoliation increased to 121,291 ha in 2009 from 102,917 ha in 2008. The largest defoliated area covered parts of Manitoulin Island and was spread in a north-eastern direction toward Lake Temagami in North Bay District. Major pockets were located near the communities of Hagar, Espanola, Nairn Centre and Dowling. Pockets of defoliation also occurred north and east of Lake Wanapitei.

Figure 2.6 Spruce budworm defoliation on white spruce in northeastern Ontario (photo by W. Byman).

Defoliation in Sault Ste. Marie District declined slightly in 2009 to 4,249 ha compared to 5,191 ha in 2008 and occurred within the city boundary. The majority of defoliation was in the north end of the city where white spruce trees experienced severe defoliation. Mature and overmature white spruce had the most damage and the cumulative defoliation caused severe decline or mortality in some trees. Balsam fir was also affected but overall defoliation was moderate. A small pocket of moderate-to-severe defoliation caused by spruce budworm was also detected in Kirkwood Township, along McCreights Road.

Spruce budworm defoliation in Southern Region also experienced an overall decrease in total area of moderate-to-severe defoliation in 2009. Although the total area affected dropped to 1,126 ha in size, some districts within this region reported an increase in moderate-to-severe defoliation. The largest decrease was in Parry Sound District while Peterborough District had a slight increase in defoliation from spruce budworm. Peterborough District reported moderate-to-severe defoliation south of Eels Creek in the northwest corner of the district. In addition, a new area of defoliation was mapped in Bancroft District.

Bancroft District, which has not experienced moderate-to-severe defoliation since 2004, had 381 ha of defoliation in the south end of the district, within Petroglyphs Provincial Park. Damage by this insect was also detected within and north of Petroglyphs Provincial Park. The total area of moderate-to-severe defoliation caused by this insect during 2009 within Peterborough and Bancroft districts was 482 ha. Other areas not mapped due to light defoliation in the Peterborough District include Cava, Millbrook and Monaghan townships, and near Jackson Creek and Hwy. 7 in Caravan Township.

Ground surveys in Midhurst District revealed low populations of spruce budworm at a site in the Chatsworth area of Grey County. Moderate-to-severe defoliation was also recorded at this site in 2008.

Three small areas of moderate-to-severe defoliation were recorded in Parry Sound District, west of Lost Channel along Hwy. 522 and north in Pakeshkeg River Forest, Mowat Township. These areas totaled 644 ha, a decrease from 4,121 ha in 2008.

Several areas with trace defoliation were observed throughout Pembroke District and Algonquin Provincial Park. Spruce budworm populations were evident at light levels during the larval feeding period, however follow-up surveys did not detect visible defoliation from air or ground.

Mortality caused by consecutive years of moderate-to-severe defoliation by spruce budworm was aerially mapped again in Ontario in 2009. In 2009, the cumulative mortality was 180,031 ha, up considerably from 2008 (Table 2.3). The majority of this mortality was recorded in Northeast Region with a total cumulative mortality of 176,119 ha, split between North Bay and Sudbury districts. In 2009, there was also a small increase in mortality in Southern Region.

In North Bay District an additional 89,429 ha of spruce and fir mortality was mapped in 2009. Expansions of mortality were seen in the general area where mortality was mapped in 2008 between Sturgeon Falls and Lake Temagami. New pockets of mortality were mapped north, east and south of last year's mortality. Four pockets were between Latchford and the north end of Lake Temagami and one pocket was north of Wicksteed Lake between Hwy. 11 and the Quebec border. A long medium sized pocket occurred along Hwy. 11 south of the junction of Hwy. 64 and two smaller pockets reaching into Sudbury District occurred along the west arm of Lake Nipissing (Figure 2.7).

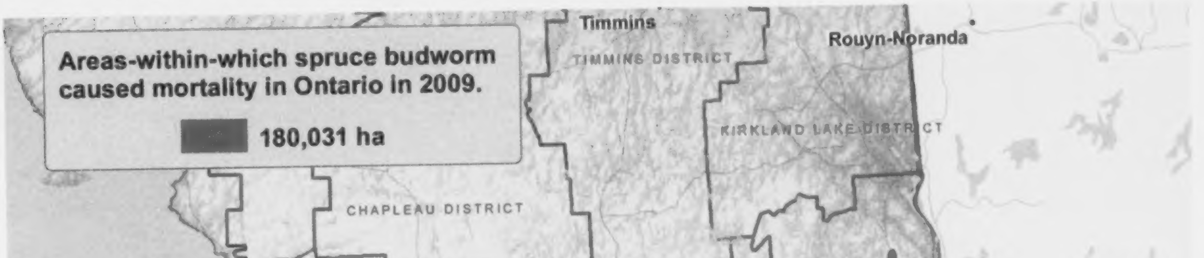

Areas-within-which spruce budworm caused mortality in Ontario in 2009.
▇ 180,031 ha
Timmins
TIMMINS DISTRICT
Rouyn-Noranda
KIRKLAND LAKE DISTRICT
CHAPLEAU DISTRICT
Lake Superior
NORTH BAY DISTRICT
Quebec
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
SUDBURY DISTRICT
Sudbury
North Bay
United States of America
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
Parry Sound
Georgian Bay
Huntsville
Bancroft
BANCROFT DISTRICT
Lake Michigan
N
Lake Huron
Orillia
Barrie
Peterborough
kilometres
0
50
100
200
MIDHURST DISTRICT

Figure 2.7 Cumulative areas-within-which spruce budworm induced mortality of spruce and fir in Ontario in 2009.

In 2009, mortality in Sudbury District was 64,998 ha, up considerably from 6,974 ha in 2008. Prior to this large increase, the area was increasing slowly at several hundred hectares per year. The mortality in Sudbury District was an extension of the North Bay District mortality in the Hagar and Warren areas close to the district boundary line. New areas of mortality were mapped northwest and southwest of the mortality detected in 2008. A large pocket of mortality was recorded south of Lake Wanapetei, another large area occurred on the south side of Nepawassi Lake and a third area was mapped near Monetville which was an extension of the North Bay District mortality.

Southern Region also had some new spruce budworm mortality south of the bulk of the mortality in Northeast Region. This mortality was all in Parry Sound District.

In Parry Sound District, a total of 1,108 ha of spruce budworm mortality was mapped in 2009. Cumulative mortality, including mortality in Algonquin Park from 2008, was 3,912 ha. This new mortality was seen east of Grundy Lake along Hwy. 522.

Table 2.3 Cumulative area of mortality caused by the spruce budworm in Ontario, 2005-2009.

Region	Cumulative Area of Mortality (ha)				
District	2005	2006	2007	2008	2009
Northeast					
North Bay	11,748	14,544	21,624	21,692	111,121
Sudbury	5,312	5,312	6,454	6,974	64,998
Sub total	17,060	19,856	28,078	28,666	176,119
Southern					
Algonquin	0	0	0	2,804	2,804
Parry Sound	0	0	0	0	1,108
Sub total	0	0	0	2,804	3,912
Provincial Total	**17,060**	**19,856**	**28,078**	**31,470**	**180,031**

Jack pine budworm, *Choristoneura pinus pinus* Free.

Jack pine budworm is a native forest pest in North America. When not present in outbreak populations the insect is still present, although not usually visible, in low numbers on the landscape. Jack pine budworm populations periodically reach outbreak levels and cause defoliation over large areas (Figure 2.8).

In the summer of 2009, jack pine budworm (Figure 2.9) defoliated jack pine (*Pinus banksiana* Lamb.) stands in Ontario. This is the fifth consecutive year jack pine budworm has defoliated large amounts of area within the province. In 2009, a total of 205,701 ha of moderate-to-severe jack pine budworm defoliation was recorded across the province (Figure 2.10), a slight increase from 168,453 ha of moderate-to-severe defoliation recorded in 2008. All three regions in the province

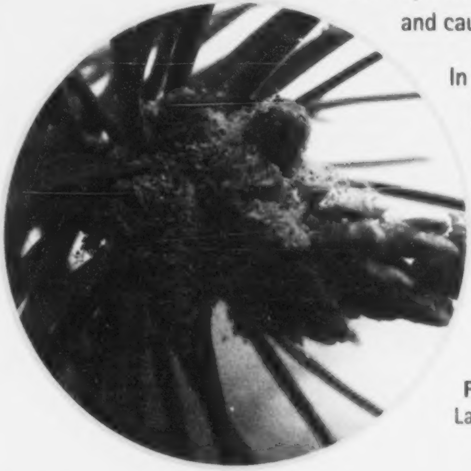


Figure 2.8 Jack pine budworm larva feeding on male flower, Red Lake District (photo by L. Rowlinson).

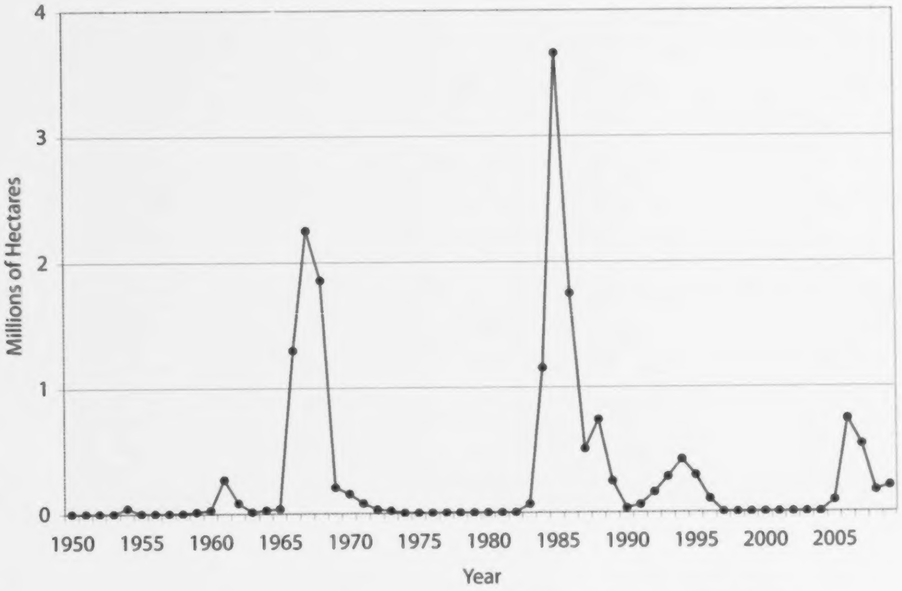


Figure 2.9 Jack pine budworm moderate-to-severe defoliation in Ontario, 1950-2009.

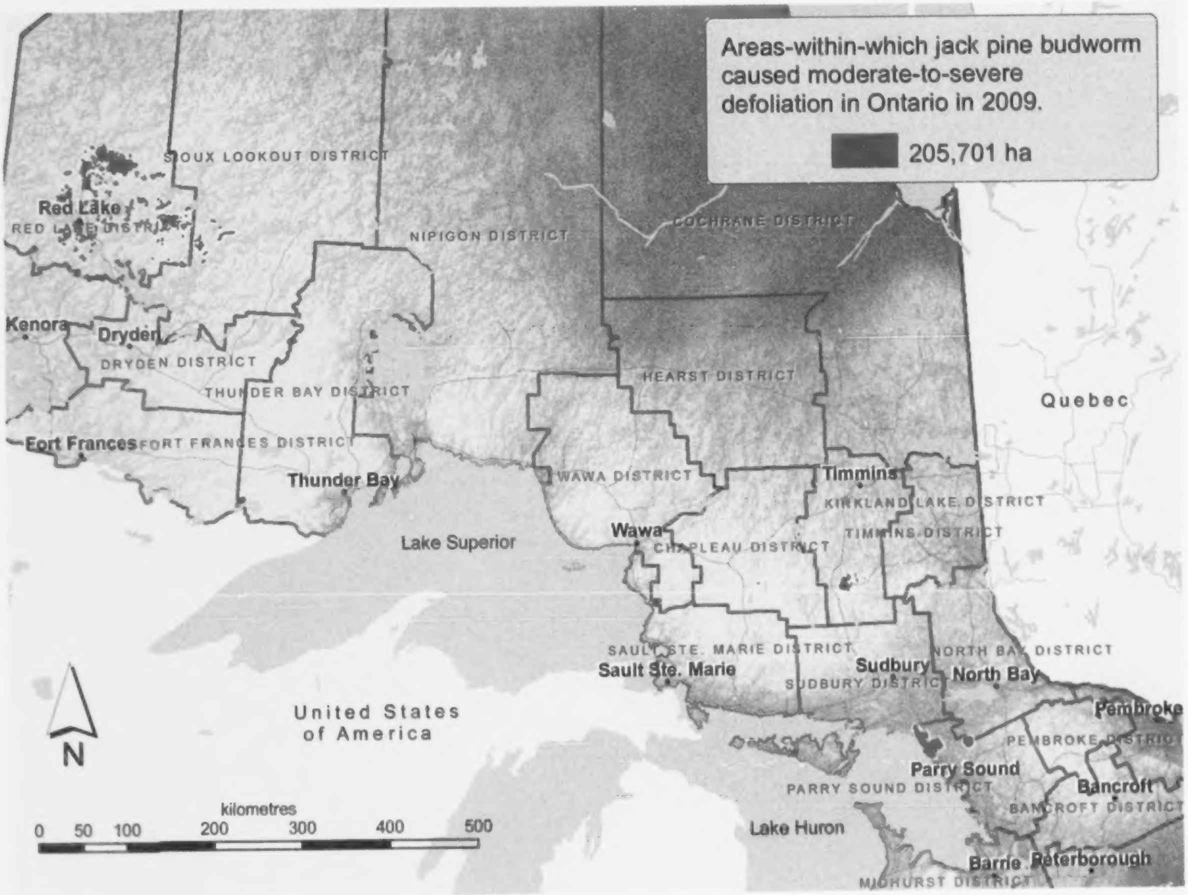

Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Ontario in 2009.
205,701 ha
SIOUX LOOKOUT DISTRICT
Red Lake
RED LAKE DISTRICT
NIPIGON DISTRICT
COCHRANE DISTRICT
Kenora
Dryden
DRYDEN DISTRICT
THUNDER BAY DISTRICT
HEARST DISTRICT
Quebec
Fort Frances
FORT FRANCES DISTRICT
Thunder Bay
WAWA DISTRICT
Timmins
KIRKLAND LAKE DISTRICT
TIMMINS DISTRICT
Lake Superior
Wawa
CHAPLEAU DISTRICT
SAULT STE. MARIE DISTRICT
NORTH BAY DISTRICT
Sault Ste. Marie
Sudbury
SUDBURY DISTRICT
North Bay
Pembroke
United States of America
PEMBROKE DISTRICT
N
Parry Sound
PARRY SOUND DISTRICT
Bancroft
BANCROFT DISTRICT
kilometres
0
50
100
200
300
400
500
Lake Huron
Barrie
Peterborough
MIDHURST DISTRICT

Figure 2.10 Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Ontario in 2009.

had recordable levels of defoliation in 2009. In Northwest Region, affected districts included Red Lake, Sioux Lookout and Dryden. In Northeast Region moderate-to-severe defoliation was recorded in Chapleau, Timmins, Sudbury and North Bay districts while Southern Region had jack pine budworm defoliation in Parry Sound and Pembroke districts as well as Algonquin Park (Table 2.4).

In Northwest Region, aerial surveys revealed 154,821 ha of moderate-to-severe defoliation, the majority (147,204 ha) of which was mapped in Red Lake District.

Defoliation mapped in Red Lake District in 2009 increased by 32,163 ha compared to defoliation recorded in 2008 (Table 2.4). The largest pocket of moderate-to-severe defoliation was found between the north shore of Little Vermillion Lake and the north shore of Berens Lake east of the community of Pikangicum. The eastern edge of this large pocket was Mamakwash Lake. Overall this area represents a slight northeastern advancement from areas defoliated in 2008. The remainder of the defoliation consisted of many smaller pockets scattered throughout the southern portion of the district and was mapped between Pakwash, Red and Longlegged lakes. Northwest of Red Lake, a band of moderate-to-severe defoliation was mapped between the Pine Ridge Road and Harding Lake in the north, along the eastern boundary of Woodland Caribou Provincial Park. To the east, defoliation was mapped between Trout, Jeanette, Shabumeni and Slate lakes.

Table 2.4 Gross area of moderate-to-severe defoliation caused by jack pine budworm in Ontario, 2005-2009.

Region	Area (ha)				
District	2005	2006	2007	2008	2009
Northeast					
Chapleau	0	0	0	0	98
North Bay	0	0	306	0	195
Sault Ste. Marie	953	951	2,502	2,356	0
Sudbury	2,599	14,038	42,775	4,092	2,426
Timmins	0	0	4,228	20,240	6,682
Sub total	3,552	14,989	49,811	26,688	9,401
Northwest					
Dryden	1,983	116,195	178,881	0	267
Fort Frances	85,328	355,134	41,020	0	0
Kenora	1,134	248,843	227,210	12,292	0
Red Lake	0	0	6,783	115,041	147,204
Sioux Lookout	0	0	9,065	7,926	7,350
Thunder Bay	0	0	892	0	0
Sub total	88,445	720,172	463,851	135,259	154,821
Southern					
Algonquin Park	0	0	185	1,484	1,703
Parry Sound	0	4,548	21,674	4,760	39,701
Pembroke	222	407	530	262	75
Sub total	222	4,955	22,389	6,506	41,479
Provincial Totals	**92,219**	**740,116**	**536,051**	**168,453**	**205 ,701**

Sioux Lookout District had 7,350 ha of moderate-to-severe defoliation caused by jack pine budworm in 2009, a decrease of 576 ha compared to defoliation in 2008. Damage in Sioux Lookout District was mapped in stands directly south and east of the Slate Falls airstrip. In addition, defoliation was mapped further to the south between Roadhouse and Otatakan lakes and to the northwest of Anenimus Bay, Lac Seul. To the southeast of Slate Falls, moderate-to-severe defoliation was mapped along the southern shores of Bamaji and Dalgas lakes as well as on the southern shore of the Cat River.

Dryden District had a small area of moderate-to-severe defoliation totaling 267 ha southeast of Route Lake, northeast of the town of Dryden.

In Northeast Region, there was a significant decrease in defoliation in 2009 from 26,688 ha of moderate-to-severe defoliation in 2008 to 9,401 ha in 2009. Defoliation in Northeast Region occurred in Chapleau, North Bay, Sudbury and Timmins districts.

Over 70% of the jack pine budworm defoliation in Northeast Region was in Timmins District in 2009. A total of 6,682 ha of moderate-to-severe jack pine budworm defoliation was mapped in the southern portion of Timmins District in the Gogama area in Champagne, Garvey, Londonderry, Miramichi, Vrooman and Westbrook townships. This considerable decline in defoliation from 20,240 ha mapped in 2008 may be attributed to a forest pest management program completed this spring. An additional 2,857 ha of light jack pine budworm defoliation was also mapped in this general area during aerial surveys in 2009.

Defoliation in Sudbury District caused by jack pine budworm was mapped in the southeast corner of French River Provincial Park and affected an area of jack pine trees totalling 2,426 ha.

A small area of defoliation was recorded in North Bay District in 2009, which was part of a larger area of defoliation in Parry Sound District, Southern Region. Moderate-to-severe defoliation totalled 195 ha in East Mills Township south of the communities of Port Loring and Arnstein located in North Bay District.

A new small infestation was recorded in Chapleau District in 2009. A total of 98 ha of moderate-to-severe jack pine budworm defoliation was observed in a stand of young jack pine along Robertson Lake Road in Neelands Township south of Chapleau.

In Southern Region, Algonquin Park, Parry Sound and Pembroke districts were affected by jack pine budworm in 2009. The area of moderate-to-severe defoliation by this pest increased almost 35,000 ha in Southern Region in 2009.

Most of the increase in defoliation for 2009 occurred in Parry Sound District. Moderate-to-severe defoliation in the district increased from 4,760 ha in 2008 to 39,701 ha in 2009. In the northwest portion of the district between Pickerel River and Bayfield Inlet, affected townships were Henvey, Mowat and Wallbridge plus Magnetawan First Nations Indian Reserve #1. To the east of this area, a pocket of moderate-to-severe defoliation was mapped in McKenzie and Wilson townships in the vicinity of Island Lake, close to the North Bay District border.

Algonquin Park had a slight increase in mapped defoliation from 1,484 ha of moderate-to-severe defoliation in 2008 to 1,703 ha in 2009. Defoliation in Algonquin Park occurred in

White and Edgar townships to the southeast of Lake Traverse in the area of the Algonquin Radio Observatory, the same general area where defoliation was observed in 2008.

Pembroke District experienced a decrease in area of defoliation from 262 ha of moderate-to-severe defoliation in 2008 to 75 ha in 2009. Defoliation occurred in Hagarty and Richards Township in Bonnechere Provincial Park on the northwest shore of Round Lake.

Jack pine budworm spray program

In Ontario an insect pest management program for jack pine budworm was carried out in Northwest and Northeast regions in 2009. The program was developed by an interdisciplinary team comprised of MNR district, regional and Forest Management Branch staff, staff of the sustainable forest licensees and representatives of the local citizens committee.

The objective of a foliage protection program is to keep the trees alive and healthy until the outbreak collapses due to reduced male flower production, parasitism and disease, and lack of food.

Trees can usually withstand up to 50% defoliation, without suffering decline or mortality. To increase the chances of keeping trees alive and healthy, the objective for MNR aerial spray programs is typically to keep defoliation below 40% in sprayed stands.

MNR jack pine budworm spray programs use the bacterial insecticide Foray 76B with the active ingredient Btk (*Bacillus thuringiensis* subsp. *kurstaki*). Btk is a naturally occurring bacterium often found in the soil. It must be ingested by the larval stage. It affects only the larvae of moths or butterflies that are out feeding at the time of spraying. Btk is susceptible to ultraviolet light, and dies within about 4 days of spraying.

Northwest Region

The jack pine budworm aerial spray program in Northwest Region was conducted in Red Lake District, from June 26 to July 4, 2009. Foray 76B was applied at a rate of 30 BIU/1.5 L/ha over 58,146 ha of selected jack pine stands.

A total of 57 spray plots and 18 untreated control plots were established across the project area for efficacy assessment (Figure 2.11). For analysis, the plots were separated out as northern plots, where budworm populations were relatively high and southern plots, where populations were lower. In the north, there were 41 spray plots and 10 control plots. The south had 16 spray plots and 8 control plots.

Post-spray defoliation in the northern spray plots averaged 23% and was significantly lower than the 45% defoliation recorded in the control plots (Figure 2.12). Defoliation was lower in spray plots than in control plots at all pre-spray jack pine budworm population densities.

Overall post-spray defoliation in the southern spray plots averaged 14% and was significantly lower than the 32% defoliation recorded in the control plots. Defoliation in some of the unsprayed southern blocks exceeded 80%. None of the spray blocks in the south had more the 22% defoliation.

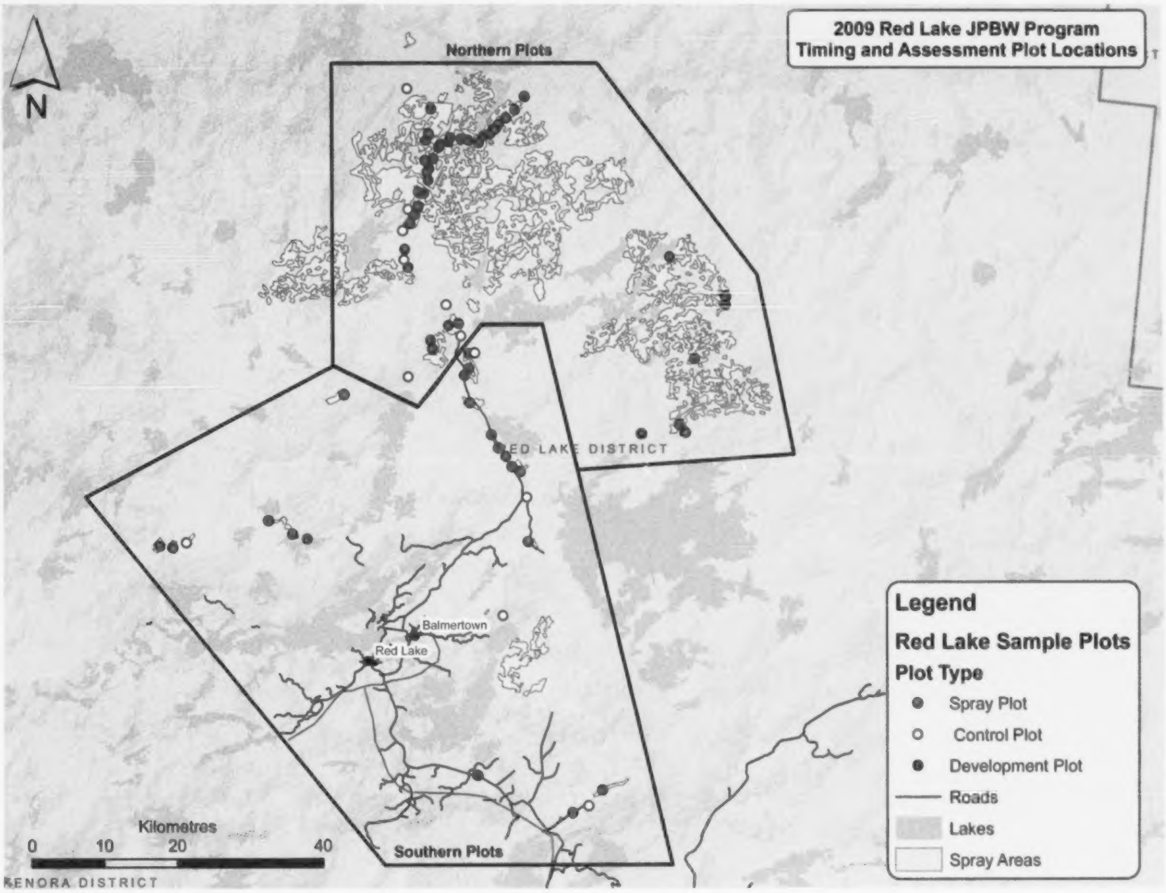

2009 Red Lake JPBW Program
Timing and Assessment Plot Locations
N
Northern Plots
RED LAKE DISTRICT
Balmertown
Red Lake
Southern Plots
Kilometres
0 10 20 40
KENORA DISTRICT
Legend
Red Lake Sample Plots
Plot Type
Spray Plot
Control Plot
Development Plot
Roads
Lakes
Spray Areas

Figure 2.11 Location of spray areas and plots used for timing the aerial spray (development plots) and efficacy assessment (spray and control plots) for 2009 jack pine budworm spray, Red Lake District.

The 2009 aerial spray program in Northwest Region was conducted considerably later than in previous years because of the cool wet weather during the spring. Despite this challenge, the program was successful in meeting its objective of keeping the trees alive and healthy. Overall, defoliation in spray blocks was less than half of that of unsprayed blocks, and was kept below the threshold of 40%.

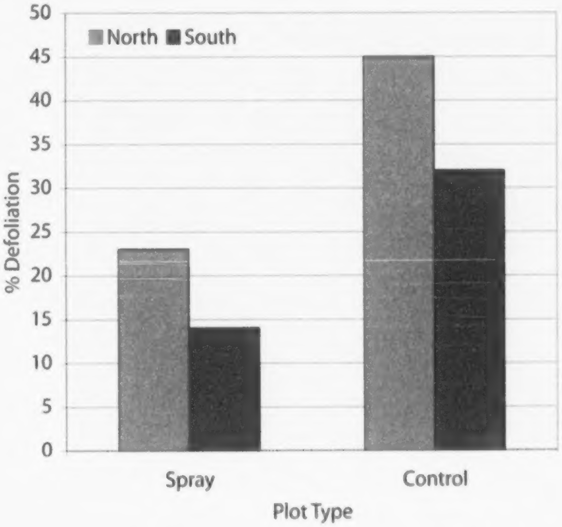


Figure 2.12 Comparing defoliation severity in sprayed and unsprayed areas of the jack pine budworm infestation in Northwest Region, 2009.

Northeast Region

The jack pine budworm aerial spray program in Northeast Region was conducted in Timmins District, Gogama area, from June 20 to June 23, 2009 (Figure 2.13). One application of Foray 76B was applied at a rate of 30 BIU/1.5l/ha over 22,438 ha and two applications of the same product, at the same rate, were applied to 394.6 ha of selected jack pine stands.

A total of 35 spray plots and 11 control plots were established across the project area to assess the efficacy of the spray program. Spray and control plots were established in jack pine stands and were assessed for jack pine budworm populations and defoliation levels.

It is worth noting the majority of the population densities were <5 larvae/branch in both the spray plots and control plots (Figure 2.14). Population reduction in the sprayed plots was still significant with a reduction of 38%.

Post-spray defoliation in the spray plots averaged 11% and was significantly lower than the 27% defoliation recorded in the control plots (Figure 2.15). Defoliation in one of the control plots reached 67%.

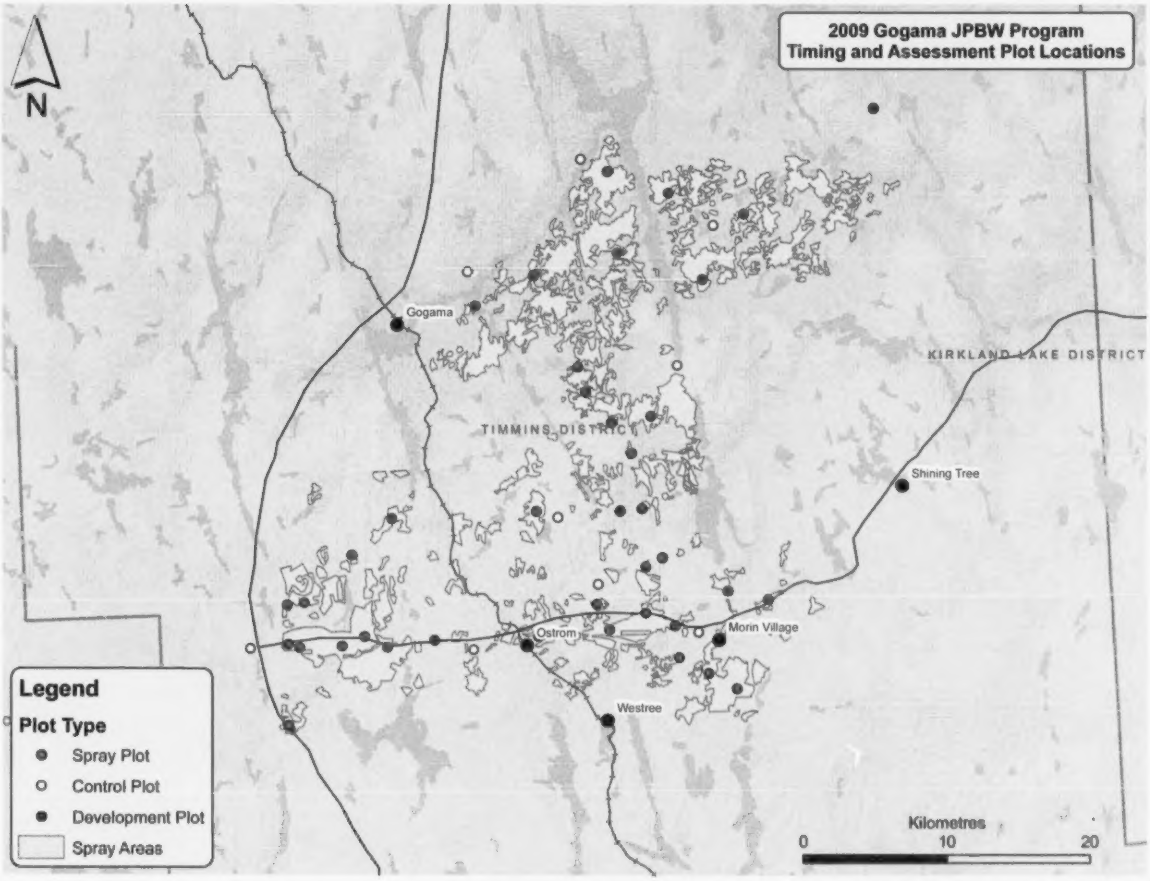

N
2009 Gogama JPBW Program
Timing and Assessment Plot Locations
Gogama
KIRKLAND LAKE DISTRICT
TIMMINS DISTRICT
Shining Tree
Ostrom
Morin Village
Westree
Legend
Plot Type
● Spray Plot
○ Control Plot
● Development Plot
▭ Spray Areas
Kilometres
0
10
20

Figure 2.13 Location of spray areas and plots used for timing the aerial spray (development plots) and efficacy assessment (spray and control plots) for 2009 jack pine budworm spray, Timmins District

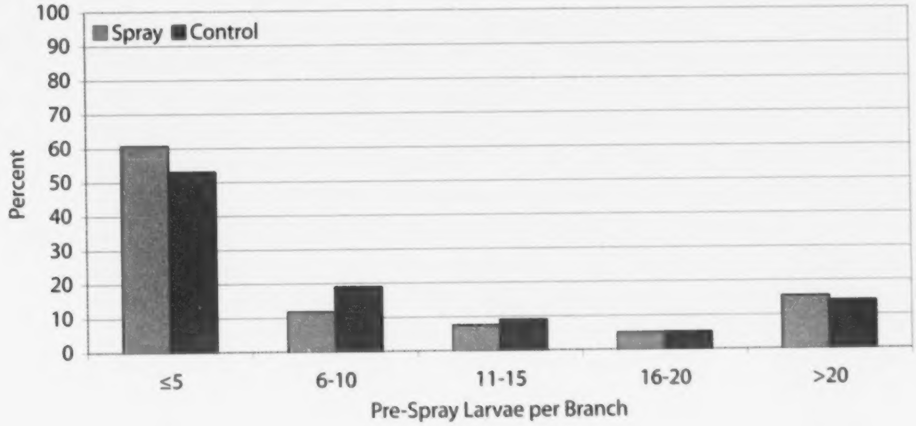


Figure 2.14 Frequency distribution of pre-spray jack pine budworm populations in the 2009 aerial spray program in Northeast Region.

The 2009 aerial spray program objective to limit jack pine budworm defoliation to less than 40% was met. Jack pine budworm populations were significantly reduced and defoliation was limited to 11% across the area sprayed in Northeast Region in 2009.

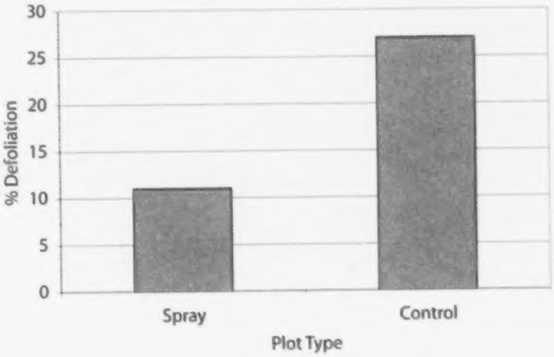


Figure 2.15 Comparing defoliation severity in sprayed and unsprayed areas of the jack pine budworm infestation in Northeast Region in 2009.

Jack pine budworm defoliation forecast for 2010

In Ontario forecasting jack pine budworm defoliation is done by performing surveys of the number of over-wintering larvae on tree branches. Jack pine budworm spend the winter as second instar larvae (L2) by encapsulating themselves in silken shelters (hibernacula) under branch scales and bark cracks. These larvae typically spend the winter in shelters from late August until the following spring. This over-wintering stage of the lifecycle provides an opportunity to collect branches, extract the larvae and count their numbers to forecast the severity of defoliation for the following spring and summer. Defoliation forecasts are used to determine which stands should be protected in an insect pest management program.

Locations for L2 surveys were selected based on the defoliation mapped during the current infestation. L2 survey plots were located in or near the current defoliation in order to predict the advancement of the infestation. Areas historically prone to jack pine budworm defoliation were selected as well, as were high value jack pine stands in the proximity of the infestation. From each location 10 trees were selected and a 1 m branch was sampled from the mid-to-upper crown of each tree. The branches were sent to a lab where they were processed in a sodium hydroxide washing procedure that extracts the second instar larvae from their hibernacula for counting. Larvae were collected and counted under a microscope to determine the average number of larvae per branch for each sample location. This average was used to forecast the expected jack pine budworm defoliation in 2010. An average of more than 54 larvae per branch forecasts severe defoliation for that location. Moderate defoliation is forecasted if there are 16 to 54 larvae per branch. Light defoliation can be expected for 15 or fewer larvae per branch.

In Northwest Region a total of 88 locations (880 trees) were sampled in 2009 (Figure 2.16 and Table 2.5) in proximity to the on-going infestation. None of the locations forecast severe defoliation for the region for 2010, and only 2 of the locations forecast moderate defoliation. A majority of the locations forecast light defoliation (77 locations) and no defoliation was forecast for the remaining locations.

Red Lake District had the bulk of L2 survey locations. Both locations that forecast moderate defoliation were collected in Red Lake District. One location with a moderate forecast was in the Murfitt Lake area and the other was just north of Debris Lake. All the remaining Red Lake locations were forecast for either light (58 locations) defoliation or no defoliation (6 locations).

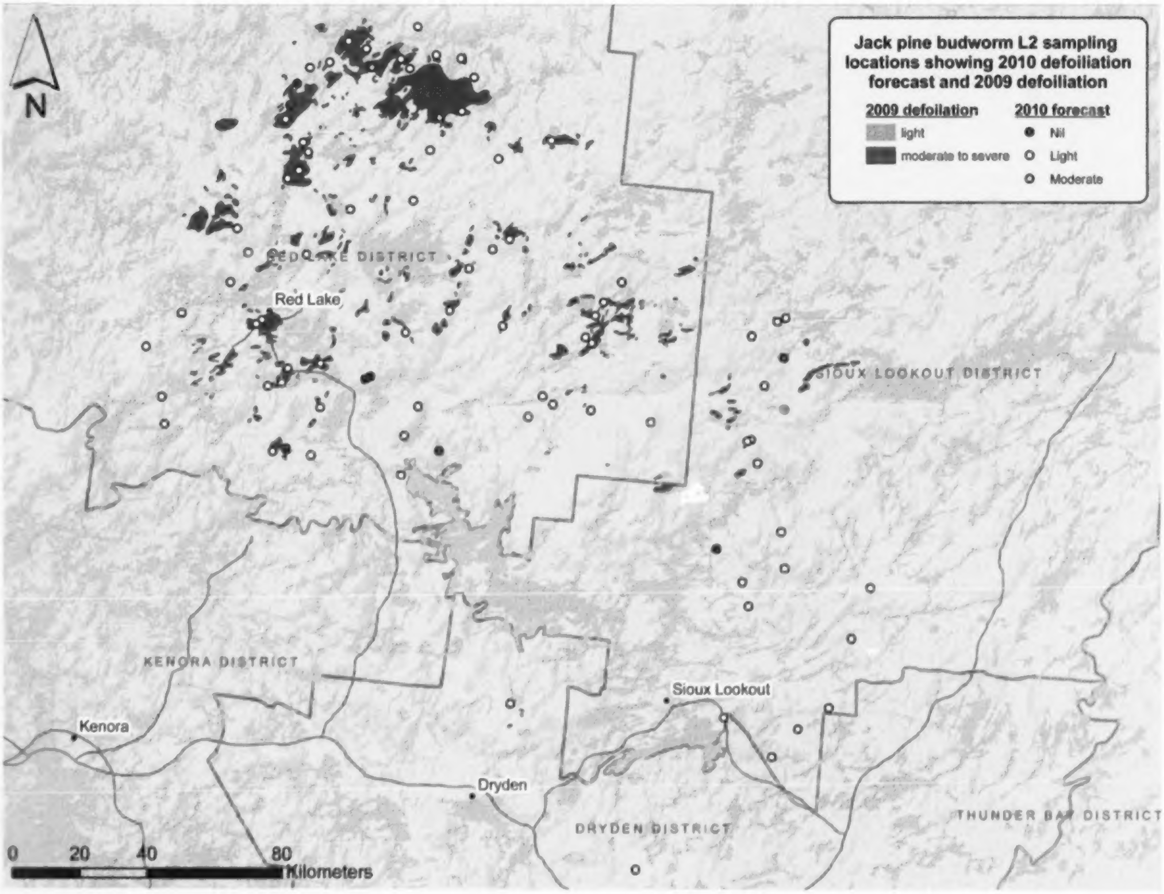

N
Jack pine budworm L2 sampling locations showing 2010 defoiliation forecast and 2009 defoiliation
2009 defoliation
light
moderate to severe
2010 forecast
Nil
Light
Moderate
RED LAKE DISTRICT
Red Lake
SIOUX LOOKOUT DISTRICT
KENORA DISTRICT
Kenora
Sioux Lookout
Dryden
DRYDEN DISTRICT
THUNDER BAY DISTRICT
0
20
40
80
Kilometers

Figure 2.16 Jack pine budworm L2 sampling locations in Northwest Region; showing 2010 defoliation forecast and 2009 defoliation.

Sioux Lookout had 20 of the L2 survey locations. All of the locations in Sioux Lookout forecast either light (17 locations) or no defoliation (3 locations).

Table 2.5 Jack pine budworm defoliation forecasts in Ontario for 2010.

Region District	Total Locations Sampled	Defoliation Forecast Nil	Light	Moderate	Severe
Northwest					
Dryden	2	0	2	0	0
Red Lake	66	6	58	2	0
Sioux Lookout	20	3	17	0	0
Sub total	88	9	77	2	0
Northeast					
Chapleau	18	8	10	0	0
Sault Ste. Marie	6	1	5	0	0
Sudbury	18	9	9	0	0
Timmins	38	8	30	0	0
Sub total	80	26	54	0	0
Southern					
Algonquin Park	3	0	2	1	0
Parry Sound	11	2	8	0	1
Pembroke	9	0	7	1	1
Sub total	23	2	17	2	2
Provincial Total	**191**	**37**	**148**	**4**	**2**

In Northeast Region almost all the locations (54 out of 80) are forecasted to have light defoliation in 2010, while 26 of the locations are forecasting no defoliation (Figure 2.17). None of the locations in Northeast Region forecast to have severe defoliation in 2010.

The only 2 locations in the province with severe forecast were in Southern Region. One was in Parry Sound District within Henvey Township on the north side of Byng Inlet near the Town of Britt. The other is in Richards Township on the eastern shore of Round Lake near Bonnechere River. Another location in this area has a moderate defoliation forecast; this area of Richards Township can be expected to experience moderate-to-severe defoliation in 2010.

One additional location with a moderate defoliation forecast occurred in Algonquin Park, near Lake Traverse, White Township.

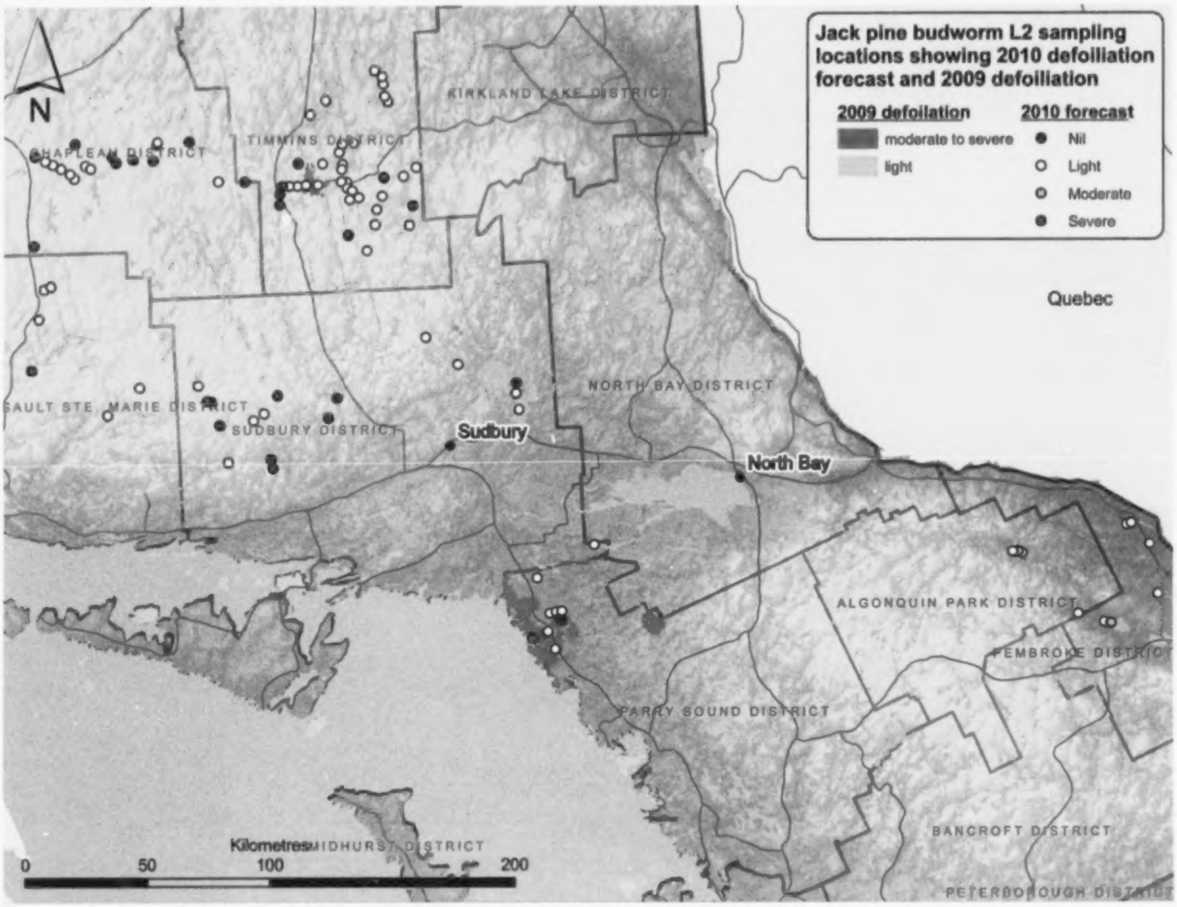

Jack pine budworm L2 sampling locations showing 2010 defoliation forecast and 2009 defoliation
2009 defoliation
moderate to severe
light
2010 forecast
Nil
Light
Moderate
Severe
N
Quebec
KIRKLAND LAKE DISTRICT
TIMMINS DISTRICT
CHAPLEAU DISTRICT
SAULT STE. MARIE DISTRICT
SUDBURY DISTRICT
Sudbury
NORTH BAY DISTRICT
North Bay
ALGONQUIN PARK DISTRICT
PEMBROKE DISTRICT
PARRY SOUND DISTRICT
BANCROFT DISTRICT
PETERBOROUGH DISTRICT
MIDHURST DISTRICT
Kilometres
0
50
100
200

Figure 2.17 Jack pine budworm L2 sampling locations in Northeast Region showing 2010 defoliation forecast and 2009 defoliation.

Jack Pine Forest Health Assessments

In the mid 1990's, jack pine plots were established across Northeast and Northwest regions of Ontario to monitor and study the impacts of jack pine budworm. In 2000, the focus of these plots was revised to include the health of jack pine forests across northern Ontario.

These permanent sample plots are monitored annually independent of any jack pine budworm infestation. Thus the results described below are for the permanent sample plots only. They do not necessarily reflect the impacts of the current jack pine budworm outbreak except where the plots are within the budworm infestation.

A total of 127 plots comprising 6,350 trees (62 plots in Northeast Region, 65 plots in Northwest Region) were assessed in 2009. The trees were rated for the presence of any pest, disease or abiotic factors that affect jack pine as well as the abundance of male (pollen) flowers. One stand was harvested in 2009, bringing the total of plots monitored to 127, down from 128 evaluated in 2008. This harvested stand was in Northwest Region just east of Vermillion Bay on Whaldof Road, Dryden District.

In 2009, jack pine tree condition in the plots was similar in both Northeast and Northwest regions in Ontario. The majority of the trees had less than 50% total defoliation of old and current foliage (Table 2.6). Slightly higher levels of defoliation were recorded in Northwest Region.

The tops of the jack pine trees were relatively healthy in both regions in 2009 (Table 2.7). Surveys revealed a significant difference in male flower abundance. In Northwest Region only 13% of the trees had moderate to high numbers of male flower abundance, compared to 64% of the trees in Northeast Region. The jack pine budworm outbreak may have triggered some trees to reduce pollen production in Northwest Region.

As shown in Table 2.8, more plots in Northwest Region had some level of defoliation by jack pine budworm than Northeast Region, but both regions were similar in overall average defoliation. The majority of the plots in Northwest Region had low levels of jack pine budworm defoliation. The exception to this was the jack pine health plot on Basket Lake Road, Dryden District which had an average defoliation of 47.4%.

It is worth noting that western gall rust was quite prevalent in Northeast Region in 2009. A total of 413 trees (19%) had this disease, the majority at trace to low levels.

Table 2.6 Condition of jack pine trees in jack pine forest health plots in Ontario in 2009.

Region	Tree Condition (% of trees)					
	Total defoliation (%)				Mortality	
	<25	25-50	51-75	>75	New	Old
Northeast	48	17	2	1	2	30
Northwest	47	17	4	1	3	28

Table 2.7 Condition of jack pine tree tops and abundance of flowers of live trees in jack pine forest health plots in Ontario.

Region	Tree Condition (% of trees)						
	Tree Top			Abundance of Flowers			
	Live	Bare	Dead	Nil	Light	Moderate	High
Northeast	97.6	1.3	1.1	2	32	34	32
Northwest	97.9	1.2	0.9	42	45	10	3

Table 2.8 Average current defoliation by jack pine budworm in jack pine forest health plots affected by jack pine budworm in Ontario.

Region	Number of plots affected	Average current defoliation (%)
Northeast	4	2.4
Northwest	27	5.4

Bruce spanworm, *Operophtera bruceata* (Hlst.)

In 2009, Bruce spanworm defoliation was aerially mapped in the Northeast and Northwest regions of Ontario (Figure 2.18). The total area of defoliation by this early season defoliator was 26,139 ha, an increase of over 10,000 ha from 2008 (Table 2.9).

In Northeast Region, Bruce spanworm was recorded in Sault Ste. Marie and Wawa districts totaling 22,097 ha of moderate-to-severe defoliation. Almost all of this defoliation was in Sault Ste. Marie District where it was seen for the second consecutive year in the north central part of the district (Figure 2.19). Overall, moderate-to-severe defoliation in Sault Ste. Marie District increased from 16,486 ha in 2008 to 21,804 ha in 2009.

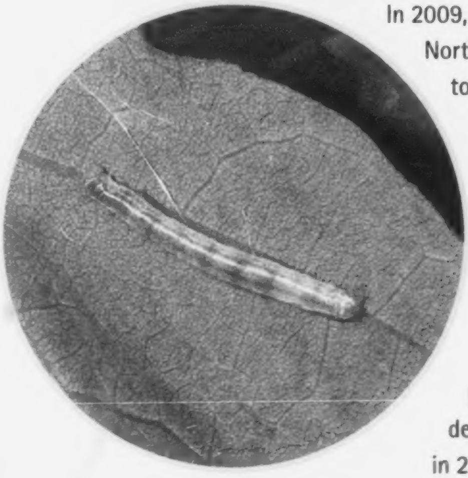


Figure 2.18 Bruce spanworm occurring on sugar maple in Sault Ste. Marie District (photo by M. Francis).

In 2009, moderate-to-severe defoliation was mapped north of Sault Ste. Marie from Bellevue Valley to Montreal River. Pockets of moderate-to-severe defoliation were scattered in this area with the largest pockets in Deroche, Hodgins, Shields, Gaudette, Wishart, Norberg, Grenoble and Desbiens townships. The hardest hit area was around the Tilley lakes in Wishart Township. Bruce spanworm defoliation also extended into the southern portion of Wawa District just north of Montreal River. Two small pockets were located in this area totaling 293 ha. The majority of the above stands were sugar maple (*Acer saccharum* Marsh.), but aspen (*Populus* spp.) was also heavily defoliated. There was also some large aspen tortrix defoliation occurring at lower levels along with Bruce spanworm in these aspen stands.

Table 2.9 Gross area of moderate-to-severe defoliation caused by Bruce spanworm in Ontario, 2005-2009.

Region	**Area of defoliation (ha)**				
District	**2005**	**2006**	**2007**	**2008**	**2009**
Northwest					
Dryden	0	0	0	0	109
Fort Frances	0	0	0	0	952
Red Lake	0	0	0	0	211
Sioux Lookout	0	0	0	0	2,777
Sub total	0	0	0	0	4,049
Northeast					
Sault Ste. Marie	0	0	0	16,486	21,804
Wawa	0	0	0	0	293
Sub total	0	0	0	16,486	22,097
Provincial Total	**0**	**0**	**0**	**16,486**	**26,139**

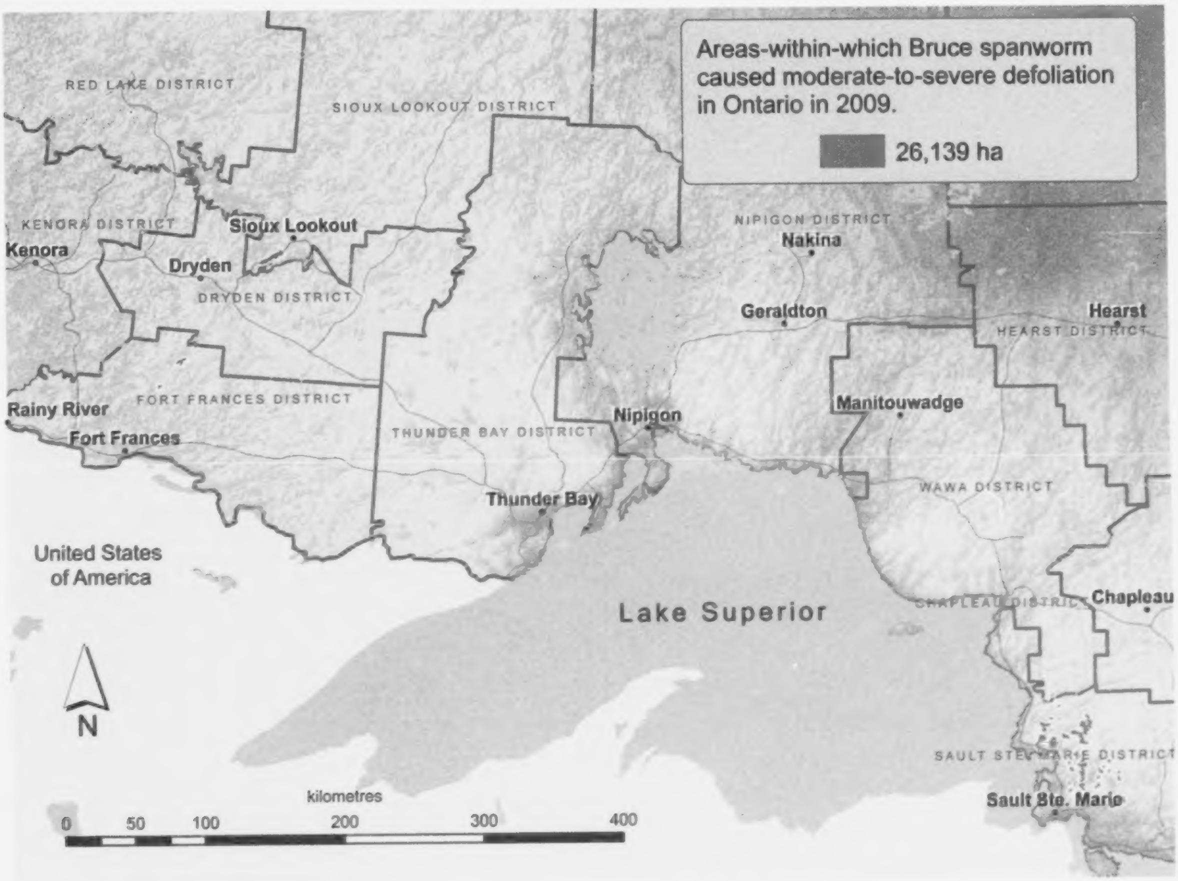

Areas-within-which Bruce spanworm caused moderate-to-severe defoliation in Ontario in 2009.
▨ 26,139 ha
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
KENORA DISTRICT
Kenora
Sioux Lookout
Dryden
DRYDEN DISTRICT
NIPIGON DISTRICT
Nakina
Geraldton
Hearst
HEARST DISTRICT
Manitouwadge
Nipigon
Rainy River
FORT FRANCES DISTRICT
Fort Frances
THUNDER BAY DISTRICT
Thunder Bay
WAWA DISTRICT
United States of America
Lake Superior
CHAPLEAU DISTRICT
Chapleau
N
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
kilometres
0
50
100
200
300
400

Figure 2.19 Areas-within-which Bruce spanworm caused moderate-to-severe defoliation in Ontario in 2009.

Bruce spanworm was also detected on St. Joseph's Island during general surveys. This damage was light-to-moderate and could not be aerially mapped. The moderate defoliation occurred on the east side of the island on Baseline, P Line and Q&R Line. The majority of this defoliation was also on sugar maple, but young understory beech (*Fagus grandifolia* Ehrh.) also had severe defoliation. Lighter defoliation was seen on A Line (Hwy. 548) near Gilbertson's Pancake House. Light defoliation was also noted during some extension calls in the east end of Sault Ste. Marie.

In Northwest Region, a total of 4,049 ha of moderate-to-severe defoliation were observed in 2009. Dryden, Fort Frances, Red Lake and Sioux Lookout districts all had defoliation by this hardwood defoliator. The majority of this defoliation was in Sioux Lookout District.

A total of 2,777 ha of defoliation were aerially mapped in the southwest end of Sioux Lookout District. This looper was feeding on trembling aspen near the town of Sioux Lookout, along Hwy. 72 from the south end of Pickerel Arm and north to Abram Lake.

Bruce spanworm has not been aerially mapped in the Fort Frances District since 2002 when just over 4,000 ha of defoliation were recorded. This year, 952 ha of moderate-to-severe defoliation were mapped within Fort Frances District during aerial surveys. Affected areas include two isolated pockets of moderate-to-severe defoliation located south of Lower Manitou Lake, just West of Hwy. 502, and one pocket south of Dogfly Lake on the Cedar Narrows Road.

In Dryden district 109 ha of defoliation were mapped near the south shore of Lower Manitou Lake. Defoliation in Red Lake District consisted of 211 ha mapped along the eastern shores of Keg Lake.

Forest tent caterpillar, *Malacasoma disstria* Hbn.

The forest tent caterpillar's natural range extends across Canada. The species has cyclical outbreaks (Figure 2.20) in the deciduous forests of Ontario. During outbreaks this pest can defoliate entire hardwood stands resulting in decreased tree vigor, growth and health.

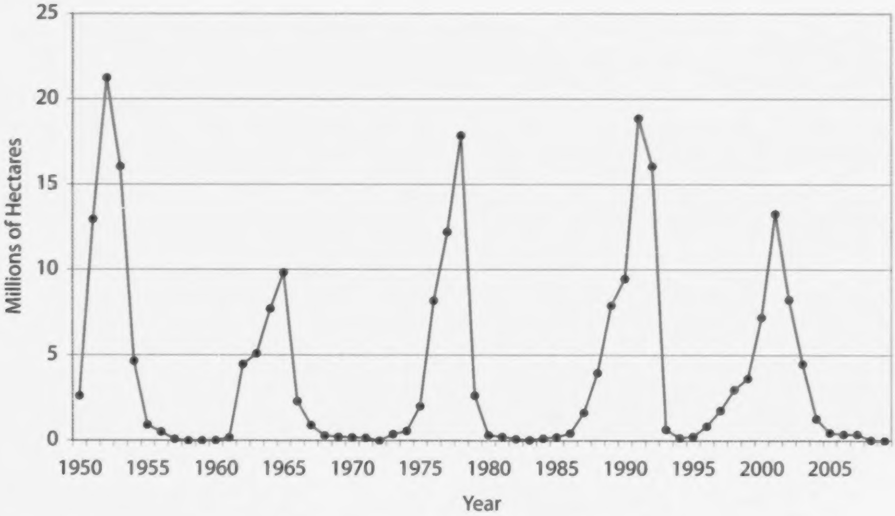
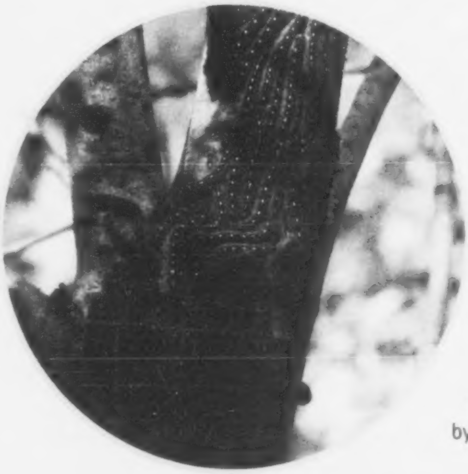


Figure 2.20 Forest tent caterpillar moderate-to-severe defoliation in Ontario, 1950-2009.



Forest tent caterpillar (Figure 2.21) has caused landscape level defoliation across Southern Region, since peaking at 315,836 ha in 2001. Populations have decreased since that peak (Table 2.10), however considerable defoliation has been recorded on an annual basis, affecting a variety of host hardwood species.

Figure 2.21 A colony of forest tent caterpillar larvae (photo by S. McGowan).

Table 2.10 Gross area of moderate-to-severe defoliation caused by the forest tent caterpillar in Southern Region from 2005-2009.

	Area of Defoliation (ha)				
District	**2005**	**2006**	**2007**	**2008**	**2009**
Kemptville	0	0	27	0	0
Parry Sound	5932	10,281	2,135	225	0
Peterborough	0	0	974	2,505	8,912
Total	**5,932**	**10,281**	**3,136**	**2,730**	**8,912**

Moderate-to-severe defoliation was mapped in and around Frontenac Provincial Park, Peterborough District from Lake Opinicon west to Desert Lake, and from Devil Lake to south of Raymonds Corner. The total area of this damage was 8,912 ha (Figure 2.22).

A large population was recorded at a commercial sugar bush operation near St. Augustine, Huron County, Guelph District; however, larval mortality had reached 50% at the time of observation and defoliation was recorded as light. Further single colony occurrences of forest tent caterpillar were noted across Aylmer and Guelph districts on sugar maple and white ash, causing trace levels of defoliation. This Lepidopteran was also noted feeding

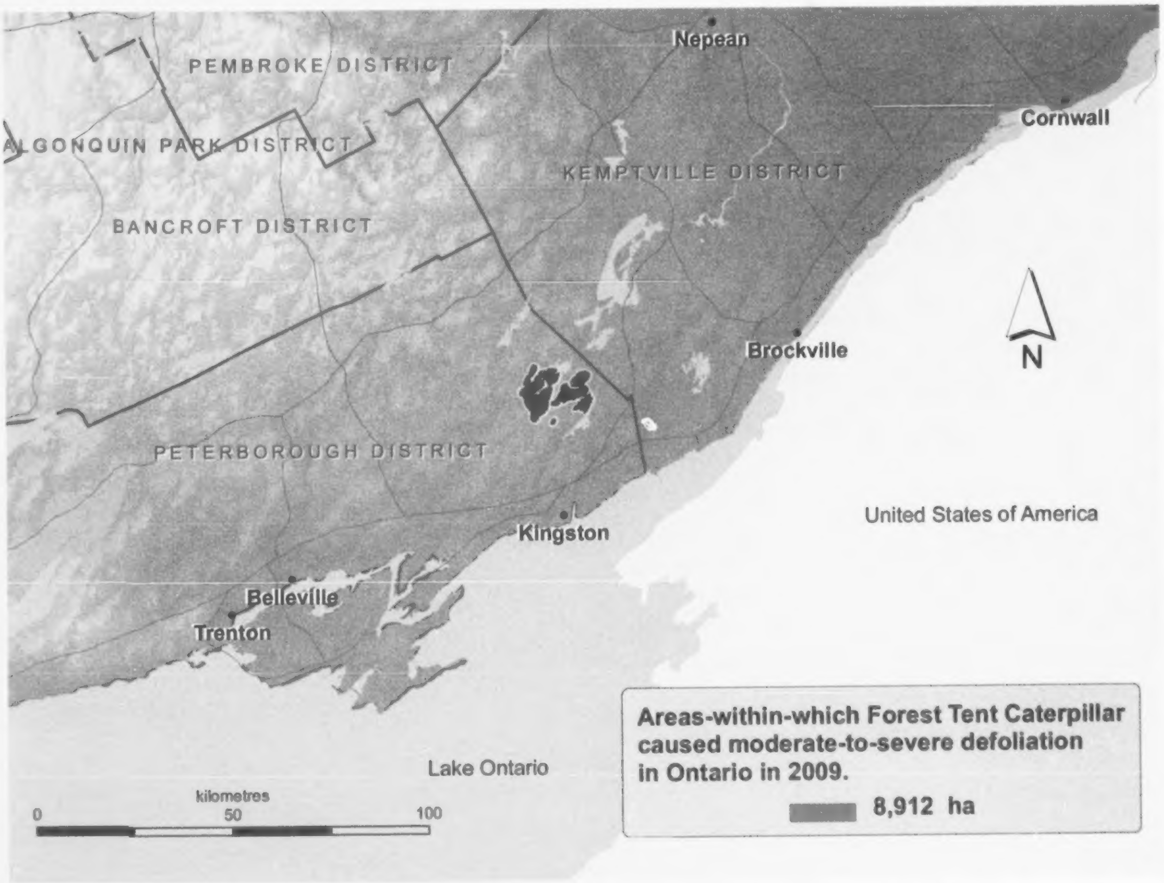

Nepean
PEMBROKE DISTRICT
Cornwall
ALGONQUIN PARK DISTRICT
KEMPTVILLE DISTRICT
BANCROFT DISTRICT
Brockville
N
PETERBOROUGH DISTRICT
United States of America
Kingston
Belleville
Trenton
Lake Ontario
kilometres
0
50
100
Areas-within-which Forest Tent Caterpillar caused moderate-to-severe defoliation in Ontario in 2009.
▬ 8,912 ha

Figure 2.22 Areas-within-which forest tent caterpillar caused moderate-to-severe defoliation in Ontario in 2009.

alongside fall cankerworm and elm spanworm, (*Ennomus subsignaria* (Hbn.)) in Aurora District. Very light populations were observed in several locations throughout Kemptville and Pembroke districts.

In 2009, defoliation by forest tent caterpillar occurred in Gatineau Park, Quebec, across the Ottawa River from Ottawa. This may indicate the population of this insect is also increasing on the Ontario side of the Ottawa River, but defoliation is not yet visible.

In 2008, moderate-to-severe forest tent caterpillar defoliation was mapped in Northeast Region totaling 40,129 ha, but no defoliation was detected during aerial mapping in 2009. Even with this decline, a few larvae were observed within Sudbury District around the community of Skead causing very low levels of defoliation.

Forest tent caterpillar larvae were seen in Chapleau District in and around the town of Chapleau where it has not been seen since 2002. Trace defoliation was found in this area.

Hickory leafroller, *Pseudexentera cressoniana* (Clem.)

In Ontario, hickory leafroller (Figure 2.23) is not normally found in large numbers or commonly associated with severe defoliation events. Adult moths emerge in spring, mate and lay eggs. Upon hatching young larvae begin feeding inside buds of host species later moving to fully-developed leaves and rolling them, characteristically from the tip down. When larval feeding is complete, larvae drop to the forest floor to overwinter in the pupal stage.

In 2009, a total of 3,561 ha of moderate-to-severe defoliation of oak (*Quercus* spp.) was aerially mapped in both Southern and Northeast regions (Figure 2.24).

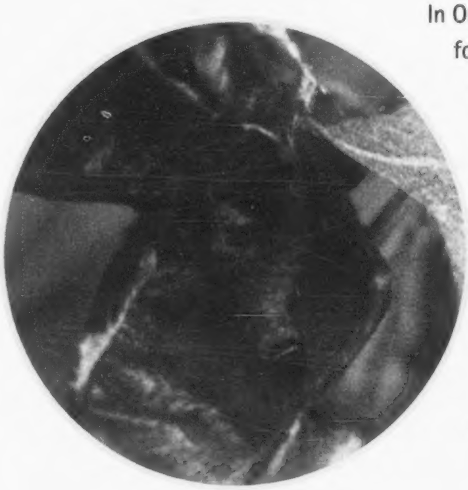


Figure 2.23 Hickory leafroller larva emerging from a rolled red oak leaf (Photo by P. Hodge).

Subsequent ground checks revealed a complex of lepidoptera species causing defoliation to red (*Q. rubra* L.) and white oak (*Q. alba* L.) stands. Hickory leafroller was the main species identified however oak leafshredder, *Croesia semipurpurana* (Kft.), was also detected amongst other incidental lepidoptera species which included *Orthosia rubescens* (Wilk.) and *Chionodes fuscomaculella* (Cham.).

The majority of defoliation by this complex was in Southern Region at 3,505 ha. In Parry Sound District, pockets of defoliation were aerially mapped west of the town of Mactier and north of Corson and Gooley lakes in The Archipelago Township. Also affected, were areas north of Lake Muskoka near Parkersville and an area stretching from Parry Sound east to Lake Vernon.

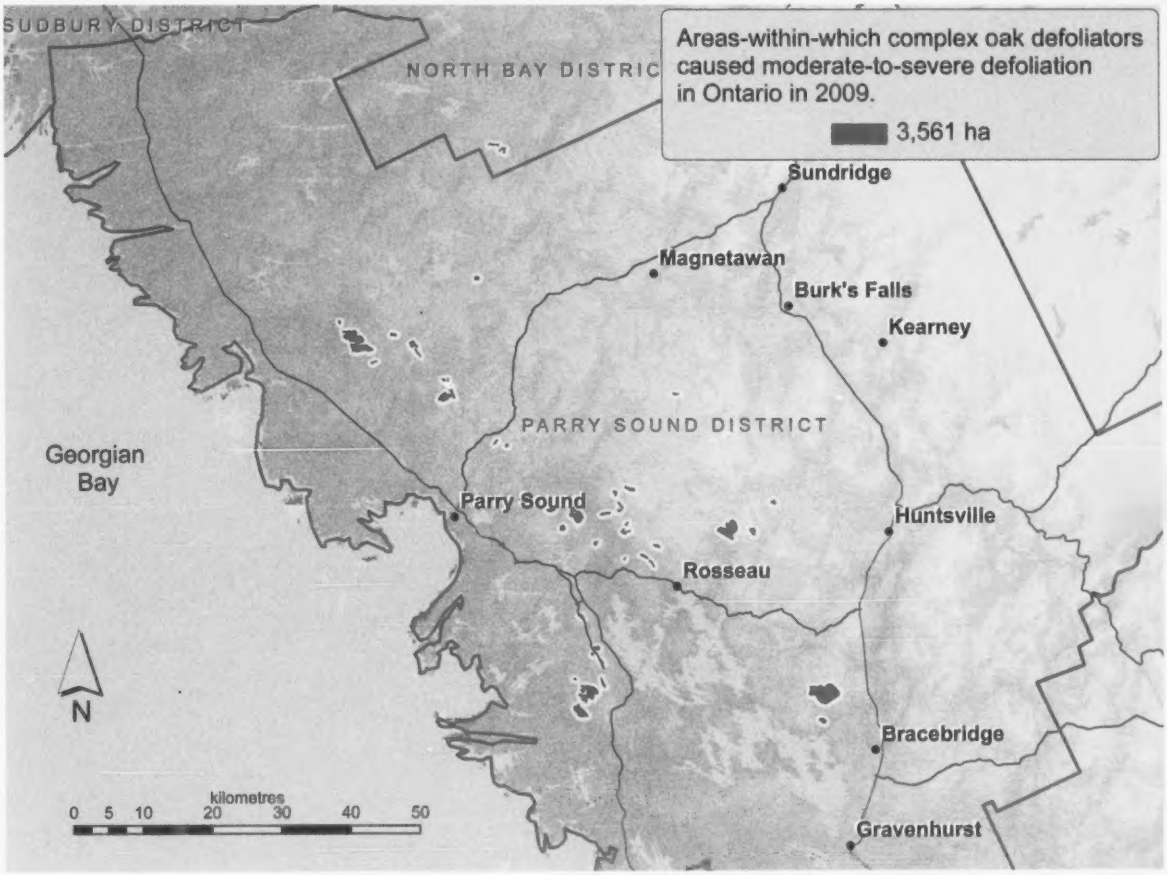

Areas-within-which complex oak defoliators caused moderate-to-severe defoliation in Ontario in 2009.
■ 3,561 ha
SUDBURY DISTRICT
NORTH BAY DISTRIC
Sundridge
Magnetawan
Burk's Falls
Kearney
PARRY SOUND DISTRICT
Georgian Bay
Parry Sound
Huntsville
Rosseau
Bracebridge
Gravenhurst
N
kilometres
0 5 10 20 30 40 50

Figure 2.24 Areas-within-which a complex of oak defoliators caused moderate-to-severe defoliation in Ontario in 2009.

A small oak stand near Midhurst District office on Nursery Road, Simcoe County was also recorded with moderate-to-severe defoliation in 2009.

In addition to areas detected in Southern Region, a pocket of hickory leafroller defoliation was recorded south of Le Grou Lake in East Mills Township, North Bay District in Northeast Region. Aerial reconnaissance revealed 56 ha of moderate-to-severe defoliation.

FOREST ABIOTIC EVENTS

Aspen decline

A total of 3,803,807 ha of aspen decline were recorded in Ontario in 2009 (Figure 2.25).

Aspen stands in Northwest and Northeast regions were displaying signs of stress such as smaller than normal foliage, branch mortality, and dead and dying tops as well as whole-tree mortality in 2009. It is unknown what caused this decline, but factors such as previous outbreaks of forest tent caterpillar, years of drought and frost episodes may have added to the amount of environmental stress placed on the trees. With the added environmental

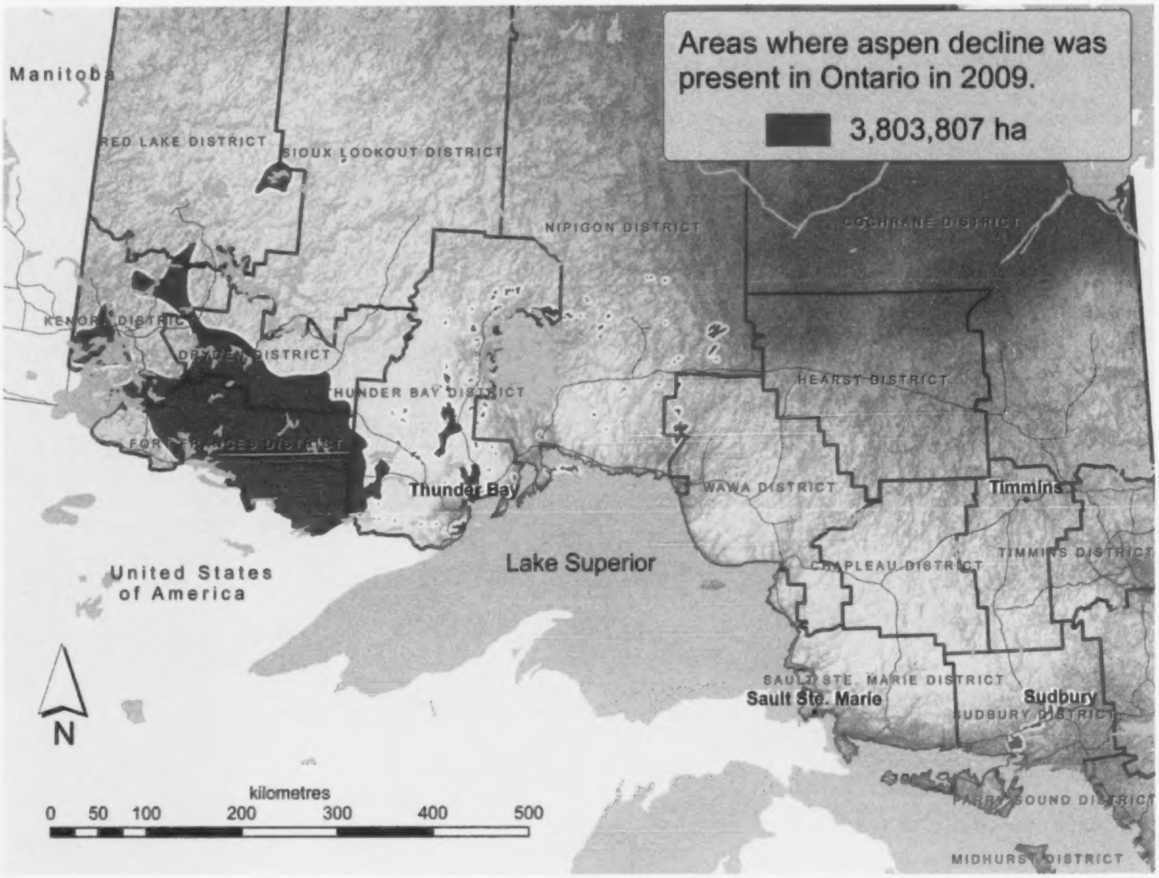

Areas where aspen decline was present in Ontario in 2009.
■ 3,803,807 ha
Manitoba
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
COCHRANE DISTRICT
KENORA DISTRICT
DRYDEN DISTRICT
THUNDER BAY DISTRICT
HEARST DISTRICT
FORT FRANCES DISTRICT
Thunder Bay
WAWA DISTRICT
Timmins
Lake Superior
CHAPLEAU DISTRICT
TIMMINS DISTRICT
United States of America
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
Sudbury
SUDBURY DISTRICT
PARRY SOUND DISTRICT
MIDHURST DISTRICT
N
kilometres
0 50 100 200 300 400 500

Figure 2.25 Areas-within-which aspen decline occurred in Ontario, 2009.

stress there was an increase in the incidence of secondary pests such as bronze poplar borer (*Agrilus liragus* B. & B.), poplar borer (*Saperda calcarata* Say), aspen leafblotch miner (*Phyllonorycter ontario* (Free.)), aspen leafroller (*Pseudexentera oregonana* (Wlsm.)), armillaria root rot (*Armillaria* spp.), septoria leaf spot (*Mycosphaerella populorum* G. E. Thomps.) and hypoxylon canker (*Hypoxylon mammatum* (Wahlenb.) P. Karst.).

The majority of the aspen decline (3,773,164 ha) was aerially mapped in Northwest Region with all seven districts being affected in 2009 (Table 2.11).

This aspen decline occurred throughout most of Fort Frances District (2,030,714 ha) in 2009. Although not every aspen tree was affected, symptoms occurred in pockets of trees and singular trees scattered throughout a stand. This made it difficult to aerially map, and was recorded as areas-within-which aspen decline occurred. The only part of Fort Frances District not affected was the southwest corner of the district from Fort Frances to Rainy River. The decline was also observed in the northern portion of the state of Minnesota.

Aspen decline extended north into Dryden District with over 702,384 ha affected. The decline was in the southern portion of Dryden District stretching from the border of Thunder Bay District in the east to the west side of Eagle Lake. The northern edge was just north of the town of Dryden and reached northeast into the Kenora District north of Vermillion Bay.

Table 2.11 Gross areas-within-which aspen decline occurred in Ontario, 2005-2009.

Region District	2005	2006	2007	2008	2009
Northwest					
Dryden	0	0	0	0	702,384
Fort Frances	0	0	0	0	2,030,714
Kenora	0	0	0	0	600,631
Nipigon	0	0	0	1,561	22,013
Red Lake	0	0	0	0	95,035
Sioux Lookout	0	0	0	0	7,080
Thunder Bay	0	0	0	308	315,307
Sub total	0	0	0	1,869	3,773,164
Northeast					
Kirkland Lake	72	0	0	0	0
Sudbury	0	0	0	0	18,462
Timmins	1,912	0	0	0	0
Wawa	0	0	0	0	12,181
Sub total	1,984	0	0	0	30,643
Provincial Total	**1,912**	**0**	**0**	**1,869**	**3,803,807**

Areas-Within-Which (ha)

Kenora District had 600,631 ha of aspen decline in 2009. There were two areas that were extensions of the decline from Fort Frances and Dryden districts and one large pocket on the west central side of the district. The extension from Dryden District reached into Kenora District as far as the east side of Separation Lake and north to Oak Lake along the border of Red Lake District. The extension from Fort Frances District went as far west as the southeast side of Lake of the Woods, Kenora District. The large pocket on the west central side of Kenora District was located west of the town of Kenora to the Manitoba border, stretching from the central part of Lake of the Woods, north to the southern portion of Sand Lake.

Aspen decline in Thunder Bay District was more fragmented with three large pockets of decline and several scattered pockets across the district. The total area affected in Thunder Bay District was 315,307 ha. One of the larger pockets was an expansion of the decline mapped in Fort Frances District which extended into Thunder Bay District south of Lac des Mille Lacs along the border of Quetico Provincial Park. The second pocket of decline was just east of Thunder Bay and travelled north to the south end of Dog Lake following the west side of Hwy. 527. The third large pocket was north of Dog Lake and went as far north as the Heaven, Cowan and Chisamore Lakes area.

The smaller areas of aspen decline were spread throughout Thunder Bay District. Several pockets were located north and east of Lac des Mille Lacs, south of Thunder Bay to the Minnesota border and north of Thunder Bay on the west side of Lake Nipigon along Hwy. 527 north of Armstrong, A slightly larger pocket occurred near the northeast corner of Lake Nipigon.

Aspen decline was also aerially mapped in Red Lake District in 2009. A total of 95,035 ha of decline were observed in two areas: one in the south central portion of the district, an extension of decline mapped in Kenora District; and a second area around Birch Lake in the east central side of Red Lake District. The first area was an expansion that stretched up from Oak Lake in Kenora District to the south end of Pakwash Lake, Red Lake District. The second area of aspen decline was recorded all around Birch Lake.

In 2009, aspen decline in Nipigon District totalled 22,013 hectares. The majority of this decline was in four long narrow pockets, on the west central side of the district between Flint Lake and Nagagami River, one large pocket in the southeast side of the district, around Vein Lake. There were also numerous small pockets of aspen decline scattered throughout Nipigon District located north of Onaman Lake, west of Long Lake and in the Black Bay area.

Sioux Lookout District had the smallest area of aspen decline (7,080 ha) in Northwest Region in 2009. The majority of this decline was part of a large pocket in Red Lake District around Birch Lake. The northeast extent of this pocket extended into Sioux Lookout District. Another smaller pocket was east of this larger area in the Bertrand and Lang Lake area, Sioux Lookout District.

Northeast Region had a total of 30,643 ha of aspen decline in two districts in 2009.

In 2009, Wawa District, Northeast Region, had a total of 12,181 ha of aspen decline. This seemed to be the easterly extent of the decline in Northwest Region. Aspen stands were in general decline in the northwest corner of Wawa District consisting of three pockets from the southeast end of McKay Lake to the north end of Vein Lake. The largest area of decline, Vein Lake, was west of the town of Manitouwadge and extended into Nipigon District. The other two pockets were north of the larger area on the north end of Kagiano Lake and southeast end of McKay Lake respectively.

A total of 18,462 ha of aspen decline were aerially mapped in 2009 in Sudbury District. Aspen decline in Sudbury District was very different from that observed in Northwest Region. Trees in Sudbury District were characterized by crown dieback and whole tree mortality, whereas the aspen in Northwest Region mostly appeared to be unhealthy, with thin crowns that had undersized leaves. In Sudbury District the cause of the decline was most likely due to repeated years of heavy defoliation by insects such as forest tent caterpillar and gypsy moth (*Lymantria dispar* L.). Another likely contributing factor to the decline was bud kill by winter drying or frost in combination with salt damage along Hwy. 17.

Dead and dying aspen trees were recorded in the south central part of Sudbury District between Sudbury and Espanola. The largest pocket of decline was west of Lake Panache, just south of Espanola. Several long smaller pockets of this damage were observed along Hwy. 17 between Espanola and Sudbury. The affected areas include all or parts of the following townships: Merritt, Foster, Curtin, Baldwin, Nairn, Lorne, Louise, Denison, Graham, Creighton-Davis, Snider, Rayside, Blezard, Garson, Capreol, and Lumsden.

Tornados / blowdown

Many tornados and high wind events occurred throughout Ontario in 2009. A provincial total of 7,947 ha of severe damage was recorded as a result of 20 individual blowdown events, six of which occurred in Northwest Region, one in Northeast Region and 13 in Southern Region (Figure 2.26) (Table 2.12).

In Ontario, tornados are measured using the Fujita scale (F0 to F5). Tornados measured at F0 have winds between 64 to 116 km/h; an F1 tornado can reach winds up to 180 km/h and an F2 can have winds reaching as high as 252 km/h (Environment Canada). In 2009, no tornados that occurred in Ontario surpassed an F2 status.

The most damage in the province occurred in the Red Lake, Sioux Lookout, Kenora and Dryden districts of the Northwest Region (Figure 2.27).

Four tornados touched down on July 9, 2009 in these districts. Damage from a fifth tornado, located within the Red Lake District, was found later in the season. These storms resulted in severe damage totaling 3,553 ha in Red Lake District, 2,470 ha in Sioux Lookout District, 898 ha in Dryden District and 339 ha in Kenora District.

The largest and most severe tornado for 2009, an F2, stretched 120 km northeast from Wabauskang Indian Reserve, Kenora District, through Farewell Bay on Lac Seul, across the

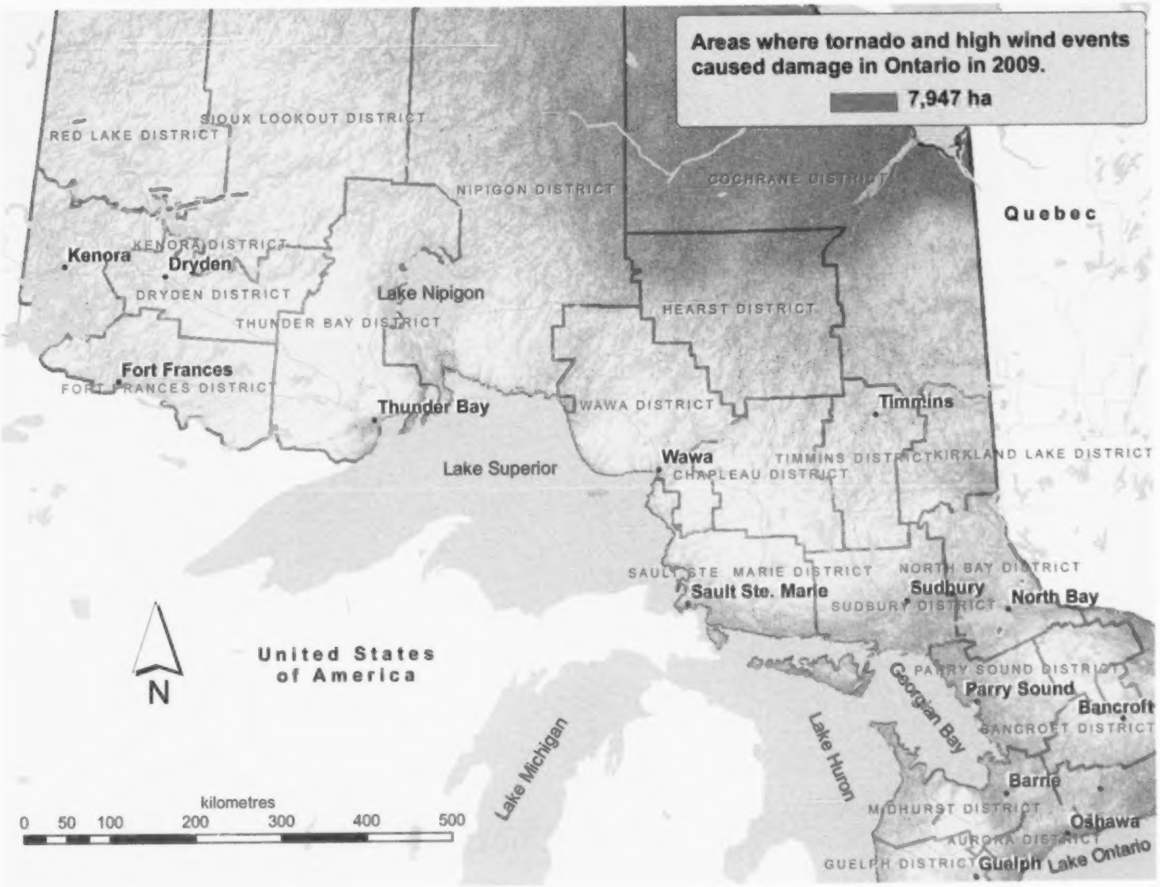

Areas where tornado and high wind events caused damage in Ontario in 2009.
7,947 ha
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
COCHRANE DISTRICT
Quebec
Kenora
KENORA DISTRICT
Dryden
DRYDEN DISTRICT
Lake Nipigon
THUNDER BAY DISTRICT
HEARST DISTRICT
Fort Frances
FORT FRANCES DISTRICT
Thunder Bay
WAWA DISTRICT
Timmins
Lake Superior
Wawa
CHAPLEAU DISTRICT
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
NORTH BAY DISTRICT
Sudbury
SUDBURY DISTRICT
North Bay
N
United States of America
PARRY SOUND DISTRICT
Parry Sound
Bancroft
BANCROFT DISTRICT
Georgian Bay
Lake Huron
Lake Michigan
Barrie
MIDHURST DISTRICT
Oshawa
AURORA DISTRICT
GUELPH DISTRICT
Guelph
Lake Ontario
kilometres
0 50 100 200 300 400 500

Figure 2.26 Areas where tornados and other high wind events damaged Ontario's forests in 2009.

Table 2.12 Areas-within-which blowdown occurred in Ontario, 2005-2009.

Region	Area of blowdown (ha)				
District	2005	2006	2007	2008	2009
Northwest					
Dryden	67,850	0	7,166	0	898
Fort Frances	4,346	0	10,039	0	0
Kenora	93,080	0	13	0	339
Nipigon	0	0	0	0	10
Red Lake	36,383	0	0	6,167	3,553
Sioux Lookout	312,706	0	0	0	2,470
Thunder Bay	1,381	208	400	444	0
Sub total	515,746	208	17,618	6,611	7,270
Northeast					
Chapleau	0	10,235	0	0	0
Hearst	45	1,020	0	0	0
Kirkland Lake	430	1,904	0	0	0
North Bay	0	25,780	0	0	329
Sub total	475	38,939	0	0	329
Southern					
Aurora	0	4	0	0	0
Bancroft	0	4,005	0	0	0
Guelph	229	0	0	0	0
Midhurst	0	0	0	0	348
Pembroke	343	13,979	0	0	0
Sub total	572	17,988	0	0	348
Provincial Total	**516,793**	**57,135**	**17,618**	**6,611**	**7,947**

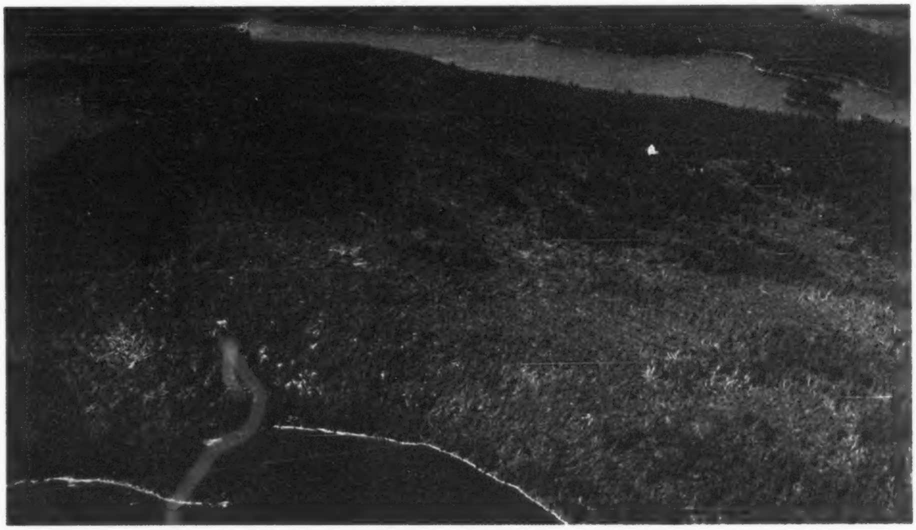


Figure 2.27 Damage from the July 9th tornado that crossed the Kenora, Red Lake and Sioux Lookout districts in 2009 (Photo by B. Smith).

Red Lake/Sioux Lookout District boundary and stopping near Dead Head Lake, in Sioux Lookout District. In addition, another tornado was spawned from this system but covered a much shorter distance. It was in the same general vicinity and contributed to the total damage recorded.

A third tornado within Red Lake District touched down just north of the community of Ear Falls. This storm traveled 25 km eastward from Detector Lake to Celt Lake.

A fourth tornado, just north of Dryden, started at the east shore of Good Lake, traveled 15 km through the west arm of Route Lake, within Dryden District. Damage from a fifth tornado was discovered in Woodland Caribou Provincial Park starting south of Thicketwood Lake and traveled 15 km northeast to Bigshell Lake, within Red Lake District.

Another blowdown event was recorded in Thunder Bay District of the Northwest Region. An area of 10 ha of severe damage was recorded on the eastern shore of an island in Stone Bay on Lake Nipigon.

Multiple tornados also occurred in 2009 in Southern Region. On August 20, 12 tornados touched down and strong winds wreaked havoc on many mixed wood stands in Southern Region.

Midhurst District received the worst damage when an F2 tornado touched down in Markdale and tracked 36 km to the town of Durham, Grey County (Figure 2.28).

This storm caused 348 ha of severe damage to hedgerows and surrounding woodlots. Approximately 80 km to the northeast of Durham, another tornado touched down causing an intermittent path of approximately 9 km of moderate-to-severe damage south to southeast of Thornbury, Grey County.

Tornados also hit urban centres of Vaughan (F2), Woodbridge (F2), Maple (F2), Newmarket (F1) and Milton (F1), all located in Aurora District. These storms mainly

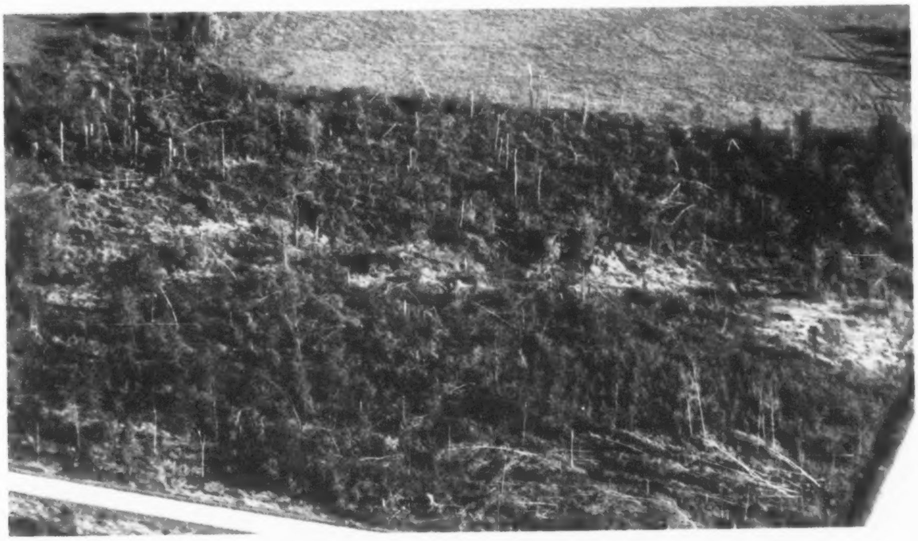


Figure 2.28 Damage from the August 20th tornado northeast of Markham, Grey County, Midhurst District in 2009 (Photo by W. Ingram).

resulted in structural damage to infrastructure and little damage to forested land.

The 12th tornado to touch down in Southern Region occurred in the Gravenhurst area, Parry Sound District and caused many trees to snap or uproot.

On that same day, another major storm event occurred resulting in one incident of blowdown in Northeast Region. A total of 329 ha of severe damage were reported from Muskie Bay and south to Beauldry Lake in Nipissing Township, North Bay District.

Hail Damage

Severe hail storms can damage trees by shredding leaves and scarring the bark. In 2009, hail damage was observed in both Northeastern and Southern regions in 2009 (Figure 2.29).

A total of 1,615 ha of damage were recorded in both hardwood and softwood stands in the province in 2009 (Table 2.13). In 2009, the majority of hail damage (1,147 ha) was in Southern Region in Aurora and Peterborough districts.

Hail was recorded south of Lindsay in Peterborough District where areas totaling 1,010 ha sustained moderate-to-severe damage. Hail damage was confirmed east of Manilla along Hwy. 7 and north of Lake Scugog along both east and west sides of Scugog River.

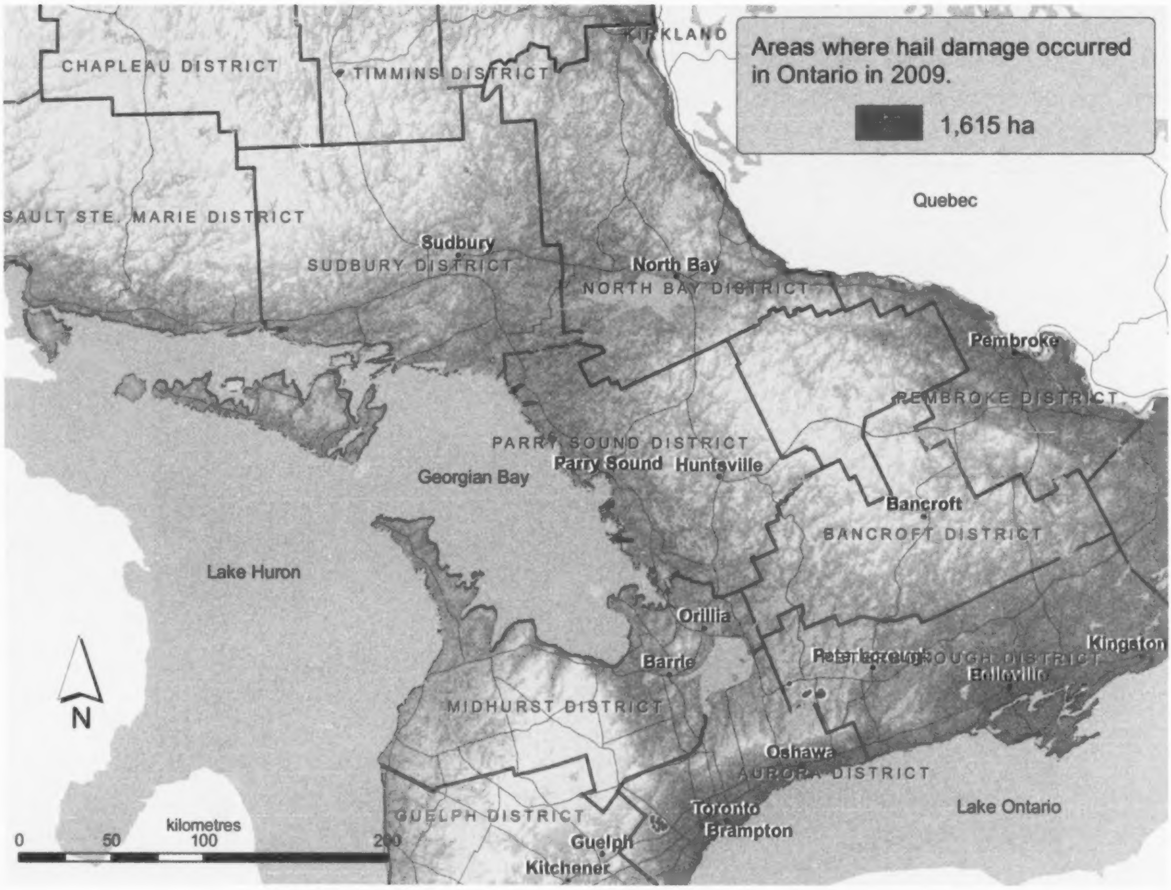

Areas where hail damage occurred in Ontario in 2009.
■ 1,615 ha
CHAPLEAU DISTRICT
TIMMINS DISTRICT
KIRKLAND
SAULT STE. MARIE DISTRICT
Sudbury
SUDBURY DISTRICT
North Bay
NORTH BAY DISTRICT
Quebec
Pembroke
PEMBROKE DISTRICT
PARRY SOUND DISTRICT
Parry Sound
Huntsville
Georgian Bay
Bancroft
BANCROFT DISTRICT
Lake Huron
Orillia
Barrie
Peterborough
PETERBOROUGH DISTRICT
Belleville
Kingston
MIDHURST DISTRICT
Oshawa
AURORA DISTRICT
Lake Ontario
Toronto
Brampton
GUELPH DISTRICT
Guelph
Kitchener
N
kilometres
0
50
100
200

Figure 2.29 Areas-within-which hail damage occurred in Ontario in 2009.

Table 2.13 Areas-within-which hail damage occurred in Ontario, 2005-2009.

Region	Area of defoliation (ha)				
District	2005	2006	2007	2008	2009
Northwest					
Red Lake	959	0	0	0	0
Sub total	959	0	0	0	0
Northeast					
Timmins	0	0	0	0	468
Sub total	0	0	0	0	468
Southern					
Aurora	0	0	732	67	137
Peterborough	0	0	0	0	1,010
Sub total	0	0	732	67	1,147
Provincial Total	**959**	**0**	**732**	**67**	**1,615**

On May 9, 2009, a hail-producing thunderstorm occurred in the Halton Hills area and moved eastward through portions of Brampton, Peel Regional Municipality, Georgetown and Halton Hills Regional Municipality, Aurora District. Hail damage occurred in several pockets along the storm's path. In total 137 ha of moderate-to-severe hail damage were recorded. Most of the damage affected deciduous trees by shredding the leaves and stripping the bark off the upper side of small branches and twigs. (Figure 2.30).

In Northeast Region, a total of 468 ha of hail damage was aerially mapped in 2009. This damage was detected in Timmins District in 2009 when trees with red tops were observed northwest of Three Corner Lake dam. Damage was found on aspen and balsam fir, as well as white and black spruce during ground checks (Figure 2.31).

Hail damage on a smaller scale was also recorded in Davies Township, Wawa District. This event was not aerially mapped, however approximately 25 ha were affected. A jack pine plantation had moderate-to-severe leader damage on 1 - 2 m jack pine trees. Scarring along the northwest facing main stem of the trees had caused leader mortality as well as some browning in the mid-crown portion of the trees.

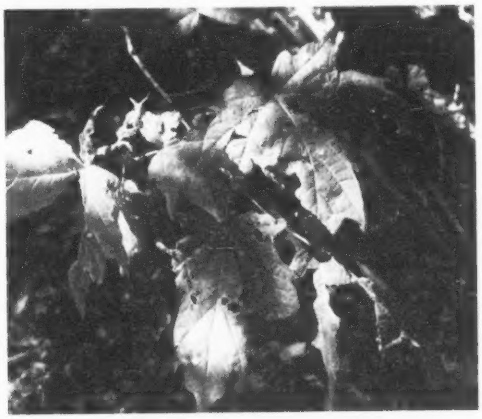


Figure 2.30 Hail damage to foliage of sugar maple in Aurora District, 2009 (Photo by P. Hodge).

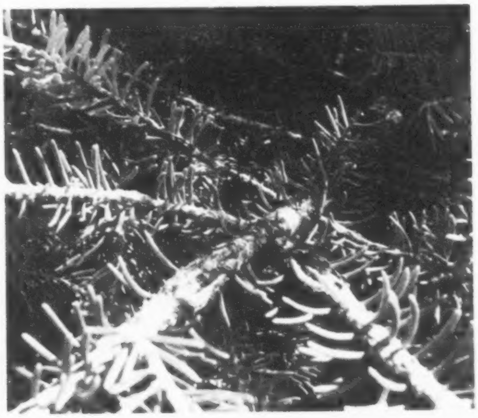


Figure 2.31 Hail damage on balsam fir in Timmins District, 2009 (Photo by J. Jamieson).

Invasive Species in Ontario's Forests

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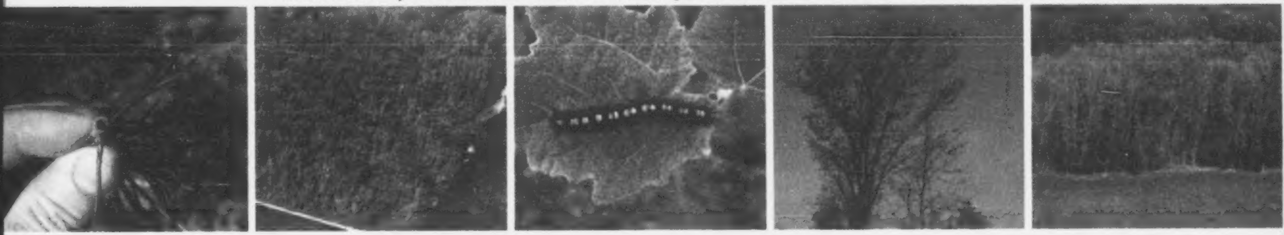
1 Ontario Ministry of Natural Resources, Forest Management Branch, Forest Health & Silviculture Section, Sault Ste. Marie

SECTION

3



FOREST INSECTS

Pine false webworm, *Acantholyda erythrocephala* (L.)

Having been first discovered in North America near Philadelphia in 1925 and first reported in Ontario in 1961, this defoliator of red pine (*Pinus resinosa* Ait.), Scots pine (*P. sylvestris* L.), eastern white pine (*P. strobus* L.), and jack pine (*P. banksiana* Lamb.) has been detected in all three regions of Ontario (Figure 3.1).

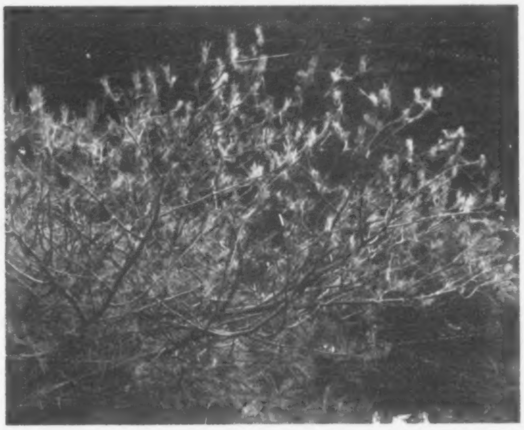


Figure 3.1 Severe defoliation and webbing caused by pine false webworm on eastern white pine (photo by S. McGowan).

In 2009, developing populations were discovered in Northeast Region while historic infestations in Southern Region diminished (Figure 3.2).

A total of 179 ha of moderate-to-severe defoliation was recorded in Northeast Region along Hwy. 17B on the west end of Garden River Reserve, Sault Ste. Marie District. The majority of feeding took place on eastern white pine, 3-4 metres in height and occasionally on mature eastern white pine deeper

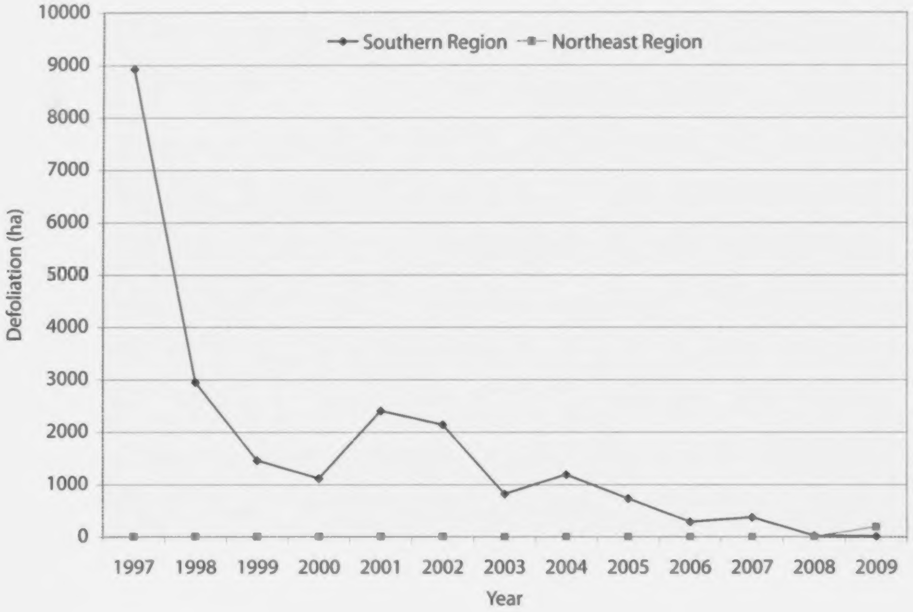


Figure 3.2 Pine false webworm moderate-to-severe defoliation in Ontario, 1997-2009.

into the stand. Trace amounts of this pest were also discovered in Kirkwood and Wells townships feeding on the same host.

In North Bay District, Northeast Region, 12 ha of moderate-to-severe defoliation on red and eastern white pine were aerially mapped on two islands in the West Arm and along Goose Island in Lake Nipissing. Light defoliation on eastern white pine was also noted along Hwy. 64 north of Field, North Bay District.

In Southern Region, defoliation in Midhurst District decreased for the third consecutive year, from 377 ha recorded in 2007 to 11 ha in 2009 (Table 3.1). Pine plantations with moderate-to-severe defoliation were located east of Cargill, Brockton Township, Bruce County, and south of Massie, Chatsworth Township, Grey County.

Infestations also occurred in historically infested sites on mature eastern white pine at kilometre 45, Barron Canyon Road, Algonquin Park; on understory eastern white pine at Petawawa Research Forest, Pembroke District; and on semi-mature eastern white pine at Larose Forest, Cambridge Township, Kemptville District.

Table 3.1 Gross area of moderate-to-severe defoliation by pine false webworm in Ontario, 2005-2009.

	Area of Defoliation (ha)				
District	**2005**	**2006**	**2007**	**2008**	**2009**
Midhurst	691	286	377	26	11
Peterburough	41	0	0	0	0
North Bay	0	0	0	0	12
Sault Ste. Marie	0	0	0	0	179
Total	**732**	**286**	**377**	**26**	**202**

Emerald ash borer, *Agrilus plannipennis* Fairmaire

Emerald ash borer (EAB) is an exotic buprestid beetle from Asia that likely invaded Ontario after first establishing in the Detroit area of Michigan. EAB was discovered in Ontario in the city of Windsor in 2002 by Ontario Ministry of Natural Resources (OMNR) and Canadian Forest Service forest health staff. By the end of 2007, populations were detected by the Canadian Food Inspection Agency (CFIA) throughout Essex County and the Municipality of Chatham-Kent; St. Clair Township, Lambton County; City of London, Middlesex County; and north of Turkey Point, Norfolk County, with OMNR detecting EAB in the Municipality of Dutton-Dunwich, Elgin County and in the city of Toronto.

In 2008, further discoveries of EAB populations were reported by municipalities and confirmed by the CFIA at several locations in Ontario. New infestations were found in Ottawa, Oakville, Pickering, Mississauga, Brampton, Vaughan, and in the north in Sault Ste. Marie. These new finds were in urban areas. The CFIA also detected EAB near the community of Bayfield in the municipality of Bluewater at a private campground in Huron County. The long distance spread of EAB beyond the original infestation of southwestern Ontario and southeastern Michigan is likely a result of people moving infested ash materials, particularly firewood.

This invasive insect attacks all species of ash (*Fraxinus* spp.). The adult beetle conducts maturation feeding on foliage, before the adults mate and lay eggs. While this results in some loss of leaf surface area, it is the larvae which kill the tree by feeding on the cambium and nearby tissues under the bark. The serpentine galleries created by the larvae eventually kill the tree by disrupting its vascular system (Figure 3.3).

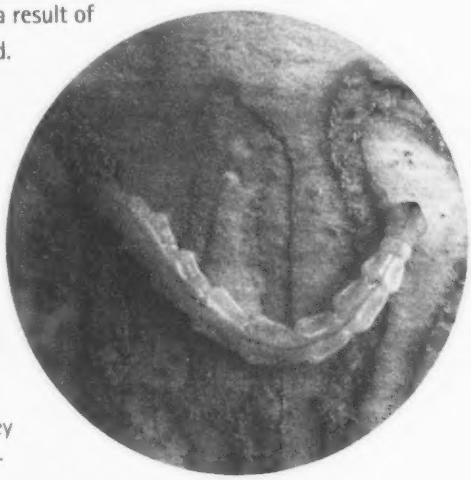


Figure 3.3 Emerald ash borer larvae and the galleries they produce under the bark of ash trees (photo by Will Byman).

The EAB, ash material, nursery trees, and firewood movement are all regulated by the Canadian Food Inspection Agency (CFIA), Plant Quarantine Division. Areas regulated by the CFIA now include Essex County and the Municipality of Chatham-Kent, Lambton, Elgin, Middlesex, Huron and Norfolk counties along with the Greater Toronto Area, the city of Sault Ste. Marie and the city of Ottawa (Figure 3.4). Areas with new findings in 2009 are being surveyed by the CFIA to determine the extent of the infestations. Changes to the areas regulated by Ministerial Order may be forthcoming pending the outcome of these additional surveys.

In 2009, aerial mapping in Southern Region revealed new areas of decline and mortality caused by EAB (Figure 3.5). Areas where damage and mortality was visible from the air have typically been infested for 3 or more years. Decline was identified on ash trees and classified as light or moderate-to-severe. Light decline consisted of ash trees with off-color chlorotic foliage which indicates poor tree health. Moderate-to-severe decline was identified by a combination of several signs of poor tree health such as chlorotic foliage (to a greater extent than light decline), thin crowns and bare dead and dying trees. In total

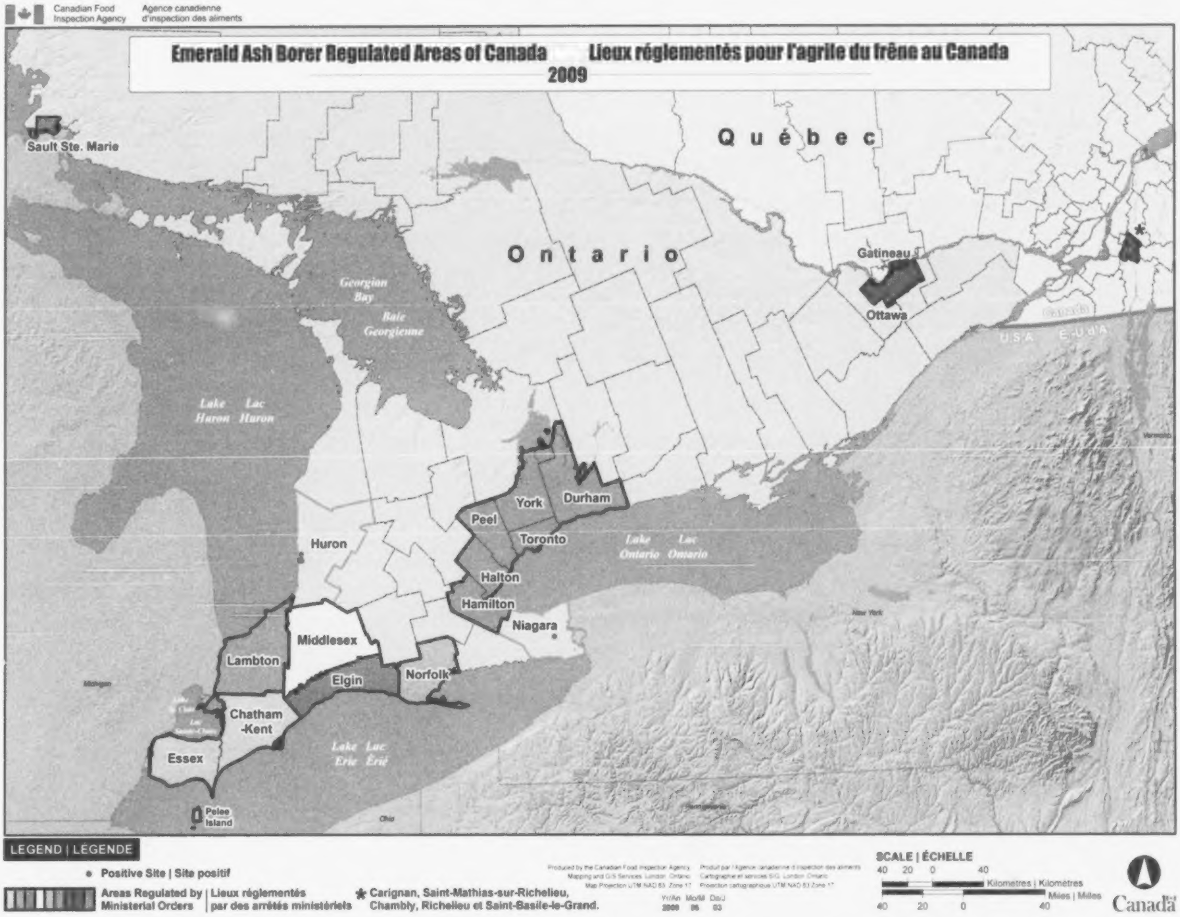

Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments
Emerald Ash Borer Regulated Areas of Canada
Lieux réglementés pour l'agrile du frêne au Canada
2009
Sault Ste. Marie
Québec
Ontario
Gatineau
Ottawa
Georgian Bay
Baie Georgienne
Lake Huron Lac Huron
U.S.A. É.-U. d'A.
Canada
York
Durham
Peel
Toronto
Lake Ontario Lac Ontario
Huron
Halton
Hamilton
Niagara
Middlesex
Lambton
Elgin
Norfolk
Chatham -Kent
Essex
Lake Erie Lac Érié
Pelee Island
Michigan
New York
Ohio
Vermont
LEGEND | LÉGENDE
● Positive Site | Site positif
Areas Regulated by Ministerial Orders | Lieux réglementés par des arrêtés ministériels
* Carignan, Saint-Mathias-sur-Richelieu, Chambly, Richelieu et Saint-Basile-le-Grand.
Yr/An Mo/M Da/J
2009 06 03
SCALE | ÉCHELLE
40 20 0 40
Kilometres | Kilomètres
Miles | Milles
40 20 0 40
Canada

Figure 3.4 Areas regulated for the emerald ash borer by the Canadian Food Inspection Agency in Ontario in 2009.

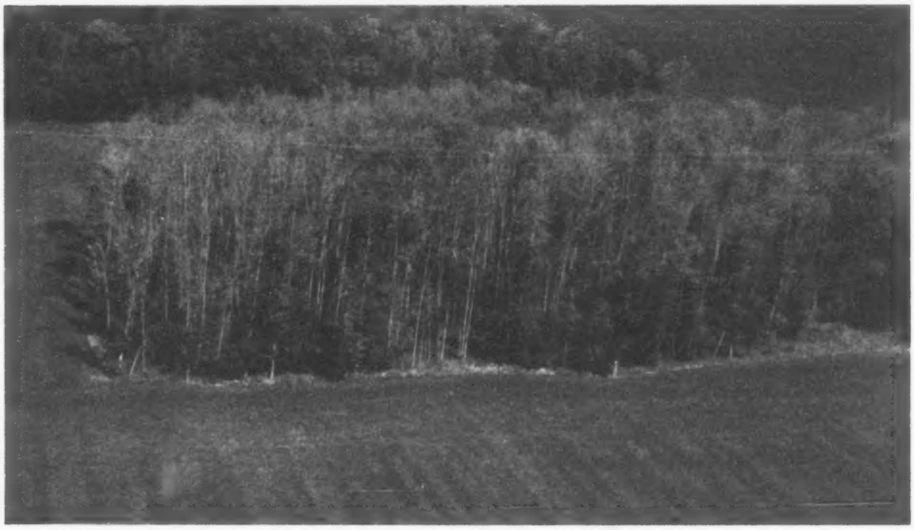


Figure 3.5 A stand of ash showing moderate-to-severe signs of decline and mortality caused by emerald ash borer in Ontario in 2009 (photo by E. Cleland).

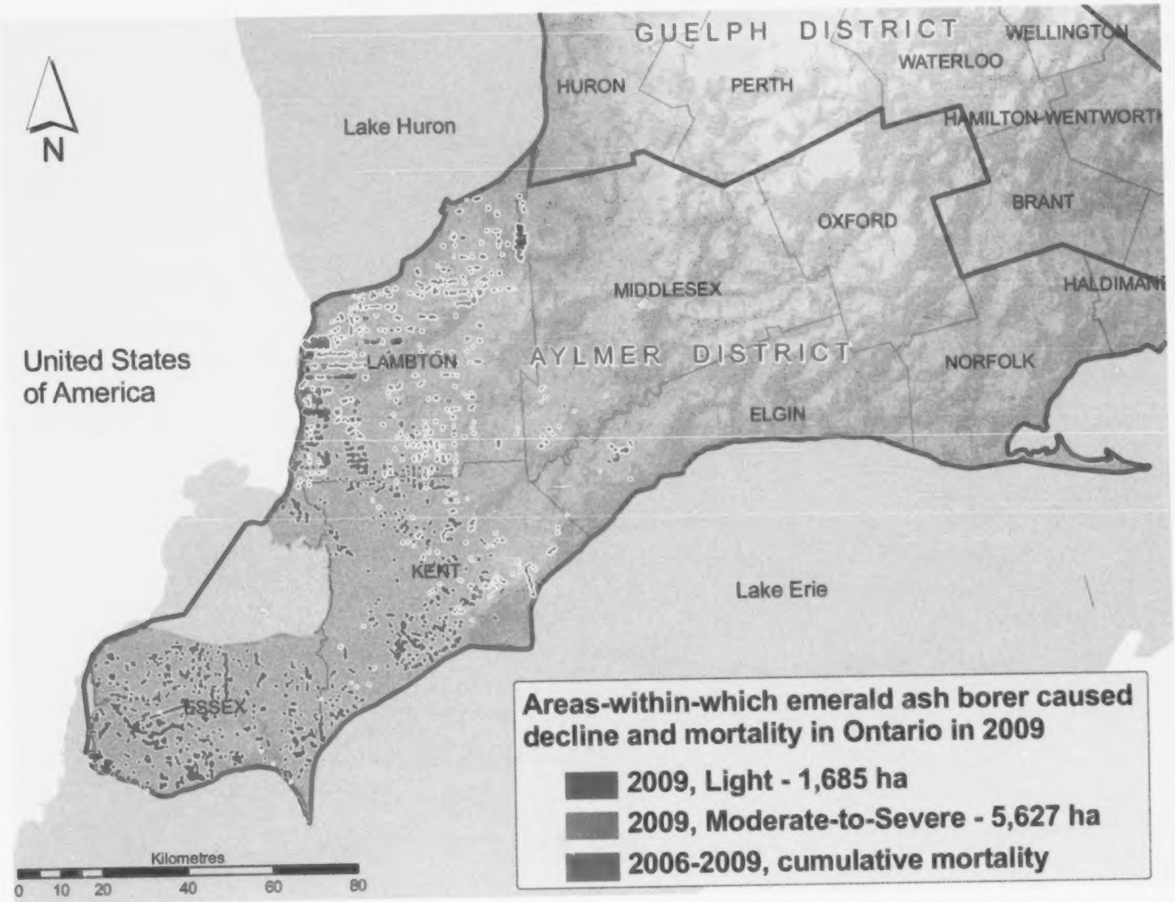

N
GUELPH DISTRICT
WELLINGTON
WATERLOO
HURON
PERTH
HAMILTON-WENTWORTH
Lake Huron
BRANT
OXFORD
MIDDLESEX
HALDIMAND
United States of America
LAMBTON
AYLMER DISTRICT
NORFOLK
ELGIN
KENT
Lake Erie
ESSEX
Kilometres
0
10
20
40
60
80
Areas-within-which emerald ash borer caused decline and mortality in Ontario in 2009
■ 2009, Light - 1,685 ha
■ 2009, Moderate-to-Severe - 5,627 ha
■ 2006-2009, cumulative mortality

Figure 3.6 Areas-within-which emerald ash borer caused decline in 2009 and mortality, 2004-2009, in Ontario.

5,627 ha of new moderate-to-severe and 1,685 ha of light decline was aerially mapped in 2009. All of this was located in Alymer District. These area figures represent net area affected. Net area affected was calculated by subtracting the non-forest component (e.g., water bodies, fields, and roads) from the gross area obtained from the aerial survey map.

The advancing front of decline by EAB was delineated by the aerial survey. To the north, the easterly boundary of the confirmed infestation is in North Middlesex Township, Middlesex County, west of the town of Parkhill. This boundary continues almost due South, following the border between Lambton and Middlesex counties. Near the village of Walkers the advancing front turns eastward and continues through Middlesex Township, Middlesex County. One small area of damage was also detected in Talbotville, Elgin County, Alymer District (Figure 3.6).

In 2009, new infestations of EAB were reported by the Canadian Food Inspection Agency. These were located outside of the advancing front of infestation. These new infestations have been found in:

- Sault Ste. Marie, Sault Ste. Marie District
- Regional Municipality of Bluewater (Bayfield), Guelph District
- Pickering, Aurora District
- Hamilton, Guelph District
- Welland, Guelph District

Research projects were also conducted by the CFS in 2009 that focused on the development of early detection tools for EAB. These research projects involved the field testing of lures and traps designed to capture adult EAB, the sampling of crown branches to detect EAB populations at low levels and bio-surveillance using native and parasitoid wasps.

Larch casebearer, *Coleophora laricella* (Hbn.)

When compared to previous years, moderate-to-severe defoliation of tamarack and larch (*Larix* spp.) due to larch casebearer has significantly decreased across the province. Since 1998, widespread defoliation has occurred in various locations across Southern Region and in the southern portions of Northeast and Northwest region. Mapping defoliation is difficult especially in the northern regions because tamarack is common in most wet areas across the landscape.

As with most defoliators, damage from larch casebearer is generally considered low in severity because healthy trees will often recover from a single season season of defoliation. Consecutive years of defoliation can cause mortality especially if the tree has been weakened and attacked by other pests such as the eastern larch beetle (*Dendroctonus simplex* LeConte).

In 2009, aerial surveys in Southern Region showed 142 ha of moderate-to-severe defoliation. This compares to 273 ha in 2008 and 10,927 ha in 2007.

In a historically infested site, 132 ha of tamarack (*Larix laricina* (Du Roi) K. Koch) in Minising Swamp, Simcoe County, Midhurst District was recorded at moderate-to-severe defoliation. An additional 10 ha of moderate-to-severe defoliation occurred near Peterwhite Lake, Darling Township, Kemptville District. Larch casebearer was also collected in Guelph and Aylmer districts defoliating small stands of European larch (*Larix decidua* Mill.) at the Royal Botanical Gardens and the St. Williams Conservation Reserve, respectively.

Defoliation was also recorded in North Bay District along Hwy. 17 just east of Sturgeon Falls, Springer Township and in many satellite pockets throughout Sudbury District.

Other notable collections were made in Fort Frances District, where larch casebearer was recorded on tamarack trees already stressed by eastern larch beetle.

Birch casebearer, *Coleophora* serratella (L.), and **lesser birch casebearer,** *C. comptoniella* (McD.)

Birch and lesser birch casebearer are very closely related: however, the exotic birch casebearer poses much more of a concern in Ontario than its native congener. Both are often found feeding alongside one another. In 2009 collections of both insects were made in Northeast and Southern regions.

In Northeast Region, birch and lesser birch casebearer were detected feeding on mature white birch (*Betula papyrifera* Marsh.) at Restoule Provincial Park, Patterson Township, North Bay District.

In Southern Region, both insects were detected feeding in low numbers on young white birch along the forest edge, Beacon Bay area, Penetanguishene, Midhurst District. In addition to these collections, the exotic birch casebearer was also recorded at Ferguson Forestry Centre, Kemptville District causing low levels of defoliation to roadside white birch.

Beech scale, *Cryptococcus fagisuga* Linding., and **beech bark disease,** *Nectria faginata* (Lohman, Watson & Ayers)

Beech scale is thought to have been introduced to North America through Halifax, Nova Scotia in the early 1920's and is considered a precursor to beech bark disease, caused by a pathogen that can ultimately be fatal to American beech (*Fagus grandifolia* Ehrh.). This complex disease consists of nectria fungi that invade the tree through small puncture wounds created by the scale insect when feeding. The fungus will then infect the tree at the point of entry. Heavy feeding by the beech scale insect creates numerous points of entry for infection to take place. Eventually the infections by the nectria fungus coalesce and girdle and eventually kill the host tree by disrupting the vascular system (Figure 3.7).

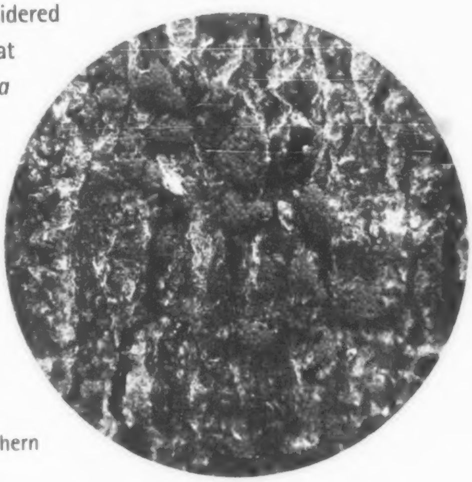
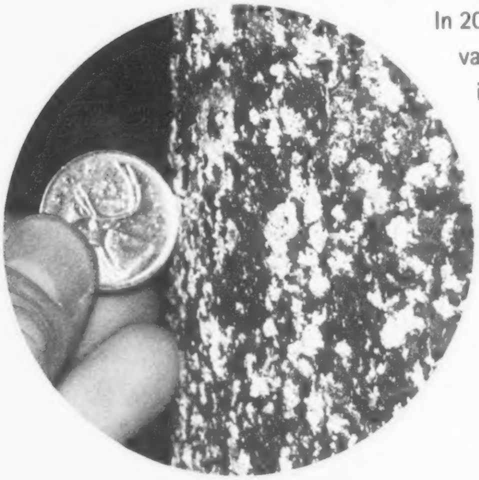


Figure 3.7 Beech bark disease on American beech in southern Ontario (photo by P. Hodge).



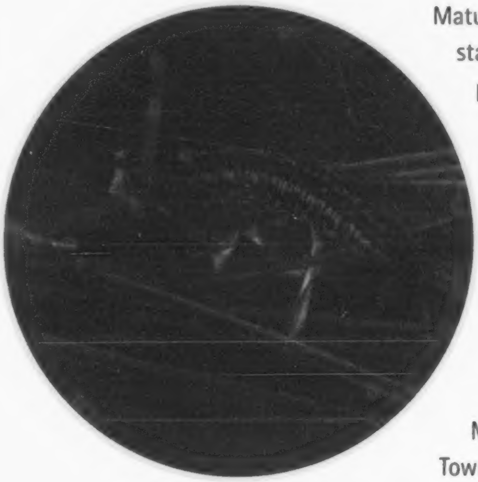
In 2009, beech scale (Figure 3.8) was recorded in various locations throughout Southern Region including Midhurst, Aurora and Aylmer districts where established populations continue to spread. Collections were made in Dorian Tract, Simcoe County Forest, Midhurst District and in Black Creek Conservation Area, Norfolk County, Aylmer District.

Figure 3.8 Beech scale on American beech in southern Ontario (photo by P. Hodge).

Introduced pine sawfly, *Diprion similis* (Htg.)

High populations of introduced pine sawfly can cause branch and whole-tree mortality to many pine species (*Pinus* spp.) in Ontario, with eastern white pine being the favoured host. Two generations of this sawfly is typical in Ontario, with the first occurring in early June and the second in late September (Figure 3.9). It is possible to have up to three generations a season if temperuatures are warm in the fall.

In 2009, this introduced sawfly from Europe was found feeding on white pine in many locations where it has previously occurred in Southern Region.



Mature larvae were detected feeding in several white pine stands throughout Parry Sound District and in isolated pockets in Midhurst, Sudbury, Pembroke and Kemptville districts.

In Parry Sound District the insect was most common west of Hwy. 69 from Severn River, Muskoka Regional Municipality, north to the French River-Main Channel, in Mowat Township. While defoliation was recorded at only trace-to-light levels in these areas, most eastern white pine were being fed upon. The insect was also found in areas outside Round Lake Provincial Park, McDougall Township and near the town of Britt, Wallbridge Township, Parry Sound District.

Figure 3.9 Introduced pine sawfly feeding on eastern white pine (photo by P. Hodge).

As in previous years, trace levels of introduced pine sawfly defoliation occurred in the Millennium Tract, Simcoe County, Midhurst District.

Other noteworthy infestations occurred near the towns of Embrun, Prescott and Russell Township and just outside Charleston, Leeds and Grenville County, Kemptville District. In Pembroke District, infestations occurred just west of the Ottawa River between the towns of Chalk River and Pembroke.

Mimosa webworm, *Homadaula anisocentra* Meyr.

Originally introduced into Essex County, Aylmer District, mimosa webworm continues to move eastward across Southern Region. This insect was originally identified in 1978 in Ontario.

Beginning in late May to early June, adult moths emerge and lay pearly grey eggs on leaves of the preferred host, honey-locust (*Gleditsia triacanthos* L.). Larvae hatch, tie together several leaflets and feed gregariously as they consume foliage within the protection of this web. Once feeding is complete larvae pupate and a second generation may occur. Overwintering occurs in the pupal stage in bark crevices and vegetation located at the base of host trees.

Larvae of this messy feeder were observed webbing leaves together in their characteristic feeding fashion (Figure 3.14) in South Walsingham Township, Norfolk County, Aylmer District. Defoliation of honey-locust reached 80% before feeding was complete in early September.

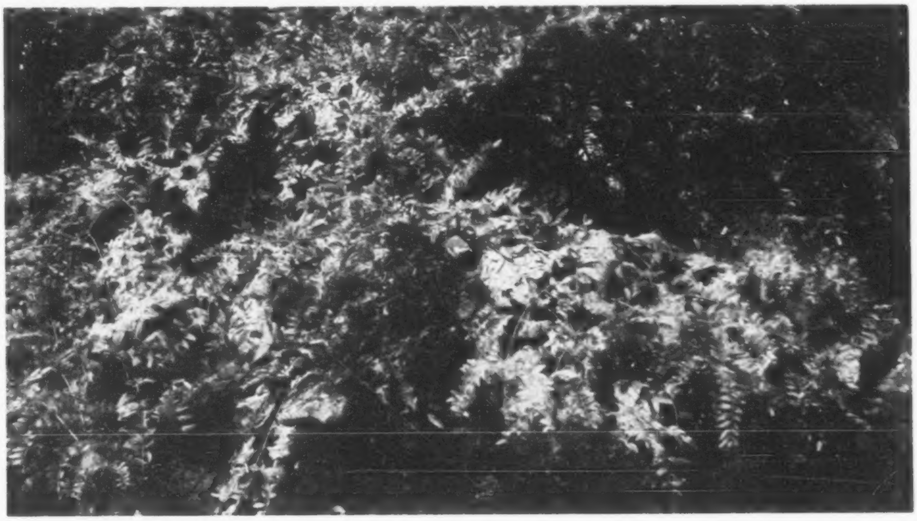
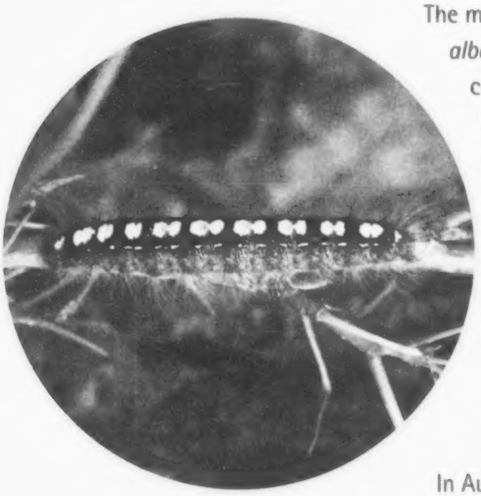


Figure 3.14 Characteristic webbed feeding of mimosa webworm on honey-locust (photo by E. Cleland).

Satin moth, *Leucoma salicis* (L.)

This European native was first introduced into North America along the east coast of Massachusetts and along the west coast of British Columbia in 1920. Although it is currently distributed throughout much of southern Ontario. This insect is also found as far north as Sudbury.



The main hosts include European white poplar (*Populus alba* L.), lombardy poplar (*P. nigra* L. cv. Italica), eastern cottonwood (*P. deltoides* Barr. ex Marsh), and willow (*Salix* spp.).

In Midhurst District, 70% defoliation occurred on a number of hedge rows comprised of mainly trembling aspen (*P. tremuloides* Michx.) south of Primrose, along Hwy.10, Dufferin County (Figure 3.15).

Figure 3.15 Severe defoliation on European trembling aspen (photo by P. Hodge).

In Aurora District, defoliation on eastern cottonwood was noted along Wilcox Rd, Durham Regional Municipality where branch and stem mortality was evident.

In Guelph District, collections were made near the town of Jarvis where satin moth has been recorded on European white poplar for the third consecutive season. The severity of defoliation has dropped from 100% in 2007 to 15% in 2009.

Gypsy moth, *Lymantria dispar* (L.)

Widespread defoliation was first documented in Ontario in 1981 near the town of Kaladar, Peterborough District where 1,450 ha of moderate-to-severe defoliation was recorded. A few years later, this number grew to nearly 250,000 ha proving to be one of Ontario's worst gypsy moth infestations (Figure 3.10). Today, gypsy moth can be found within the range of red oak (*Quercus rubra* Ait.). There is also an isolated population of this insect feeding on bur oak (*Q. macrocarpa* Michx.) in New Liskeard. No populations have been found established in north western Ontario, even though bur oak also occurs in the north west.

Populations of this European pest dropped significantly across the province. Only 385 ha of moderate-to-severe and 3,253 ha of light defoliation were recorded in 2009. This compares to 39,476 ha of moderate-to-severe defoliation recorded in 2008 (Table 3.2). In 2008 and 2009 Ontario experienced cool and wet spring and summer weather that favoured the proliferation of the larval-killing fungus, *Entomophaga maimaiga*. As a result, gypsy moth larval populations suffered very high levels of mortality from the fungus.

In 2009, defoliation was confined to Southern Region with significant populations persisting in Aylmer, Guelph and Midhurst districts (Figure 3.11).

The greatest portion of moderate-to-severe defoliation occurred in Midhurst District, with 204 ha of moderate-to-severe defoliation. This defoliation occurred in the Terra Nova Wetland Complex south of the town of Randwick, Mulmur Township, in Dufferin County.

Guelph District had only 97 ha of moderate-to-severe defoliation in 2009. This defoliation was split into two pockets located near Short Hills Provincial Park and south of the Grand River near the town of South Cayuga. In addition, 2,794 ha of light defoliation were also observed throughout the former townships of Dunn, Canborough, Sherbrooke and Moulton, Haldimand County. This population has persisted in Haldimand County since 2006 and only in 2009 has there been a reduction in moderate-to-severe defoliation. Light defoliation was also observed in Wainfleet Township, Niagara Regional Municipality and on the eastern boundary of Six Nations Native Reserve, Onondaga Township, Guelph District.

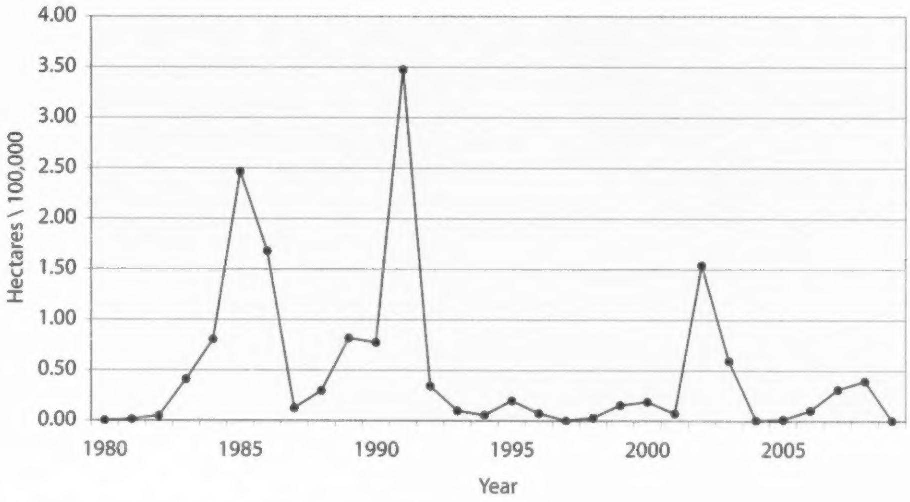


Figure 3.10 Gypsy moth defoliation in Ontario, 1980-2009.

Table 3.2 Gross area of moderate-to-severe defoliation by gypsy moth in Ontario, 2005-2009.

Region	Area of Defoliation (ha)				
District	2005	2006	2007	2008	2009
Northeast					
North Bay	0	132	0	0	0
Sault Ste. Marie	0	0	0	1,212	0
Sudbury	0	0	0	15,507	0
Sub Total	0	132	0	16,719	0
Southern					
Aurora	69	445	1,474	2292	0
Aylmer	32	776	4,064	6854	84
Guelph	1,141	8,997	25,556	11,136	97
Midhurst	0	0	0	2,459	204
Peterborough	0	0	0	16	0
Sub total	1,242	10,218	31,094	22,757	385
Provincial total	**1,242**	**10,350**	**31,094**	**39,476**	**385**

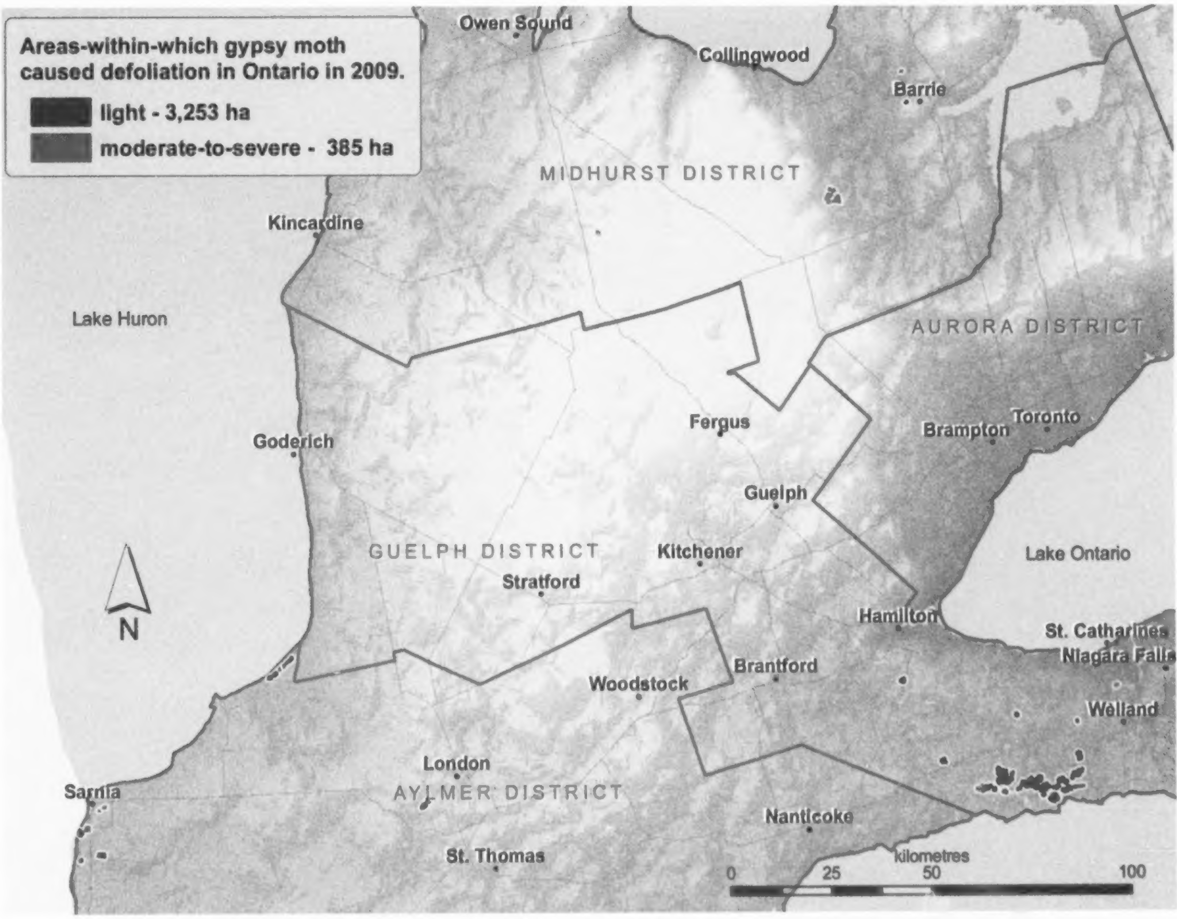

Areas-within-which gypsy moth caused defoliation in Ontario in 2009.
light - 3,253 ha
moderate-to-severe - 385 ha
Owen Sound
Collingwood
Barrie
MIDHURST DISTRICT
Kincardine
Lake Huron
AURORA DISTRICT
Fergus
Goderich
Brampton
Toronto
Guelph
GUELPH DISTRICT
Kitchener
Lake Ontario
N
Stratford
Hamilton
St. Catharines
Niagara Falls
Brantford
Woodstock
Welland
London
Sarnia
AYLMER DISTRICT
Nanticoke
St. Thomas
kilometres
0
25
50
100

Figure 3.11 Areas-within-which gypsy moth caused defoliation in Ontario in 2009.

In Aylmer District, 84 ha of moderate-to-severe defoliation occurred on urban trees in Canatara Park within the city of Sarnia. Numerous other woodlots immediately south of Sarnia were also affected. Light defoliation totalling 451 ha occurred near Mooretown, Lambton County and just west of London near the town of Komoka, Middlesex County. A small area of light damage was also aerial mapped in Pinery Provincial Park, Lambton County, where populations have persisted in recent years yet caused no mappable defoliation until 2009.

The Canadian Forest Service conducted an aerial spray research project to generate efficacy data to support the registration of Gypchek in Canada. Gypchek is derived from a naturally occurring nucleopolyhedrosis virus (NPV) which affects only gypsy moth larvae. The virus often causes major population declines. This trial took place from May 22 to May 25, 2009. Results were similar to those of a similar trial in 2008, showing higher than normal NPV infection. The efficacy test of the product though was confounded by high larval mortality from fungal infection caused by *Entomophaga maimaiga*.

At 2 locations in Southern Region, fixed-area plots (10 m x 10 m), known as Modified Kaladar Plots (MKPs), were established and the number of new gypsy moth egg masses per hectare was calculated. Within each plot there are three fixed-area subplots, which were averaged to determine the forecast for 2010. When forecasting defoliation, 1-1235 egg masses/ha predicts light defoliation; 1236-6175 egg masses/ha is associated with moderate defoliation; and more than 6175 egg masses/ha typically results in severe defoliation.

Seven sampling plots were established at the Dufferin County Main Tract and the adjoining Simcoe County Tosorontio Tract. Light defoliation is forecast for 2010 at 3 of the 7 locations. All of the remaining locations forecast no defoliation for 2010.

At Short Hills Provincial Park 5 MKP plots were established. For 2010, light defoliation is forecast at 2 locations and no defoliation is forecast for the remaining 3 (Figure 3.12).

Early birch leaf edgeminer, *Messa nana* (Klug)

Originally introduced into Canada in 1967 along the north shore of Lake Erie, this exotic sawfly is now distributed throughout the Southern Region of Ontario.

Eggs are laid in late spring along the tips of a leaf's serrated edge. Larvae hatch soon after and begin to mine within fully developed leaves causing a typical brown colour often noted at the tip of each leaf. Once larvae mature, they drop to the ground, overwinter and emerge as an adult the following spring.

In 2009, this European species was recorded causing moderate defoliation on white birch (*Betula papyrifera*, Marsh.) within a 5 ha woodlot south of Bayfield, Huron County, Guelph District.

European pine sawfly, *Neodiprion sertifer* (Geoff.)

European pine sawfly was recorded in both Southern and Northeast regions in 2009.

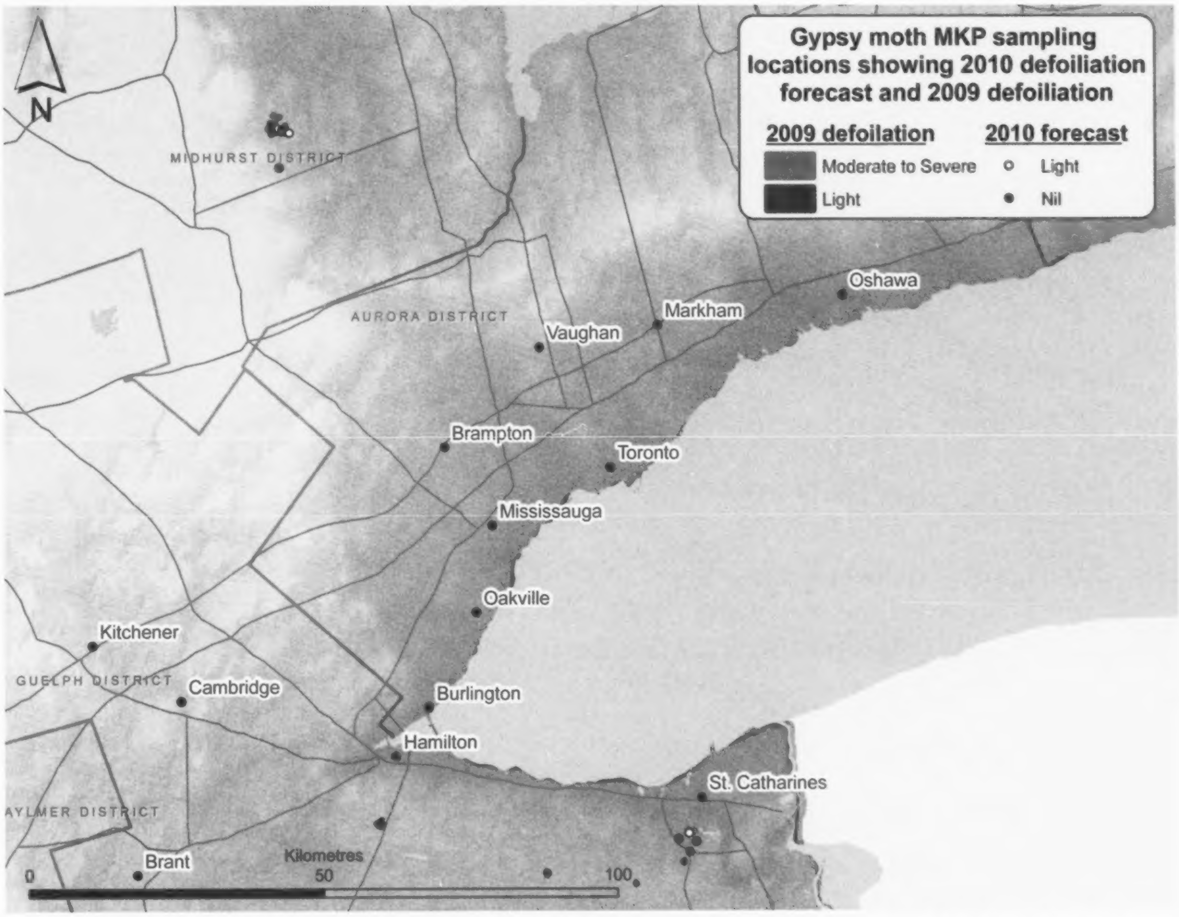

Gypsy moth MKP sampling locations showing 2010 defoiliation forecast and 2009 defoiliation
2009 defoilation
Moderate to Severe
Light
2010 forecast
○ Light
● Nil
N
MIDHURST DISTRICT
AURORA DISTRICT
GUELPH DISTRICT
AYLMER DISTRICT
Oshawa
Markham
Vaughan
Brampton
Toronto
Mississauga
Oakville
Kitchener
Cambridge
Burlington
Hamilton
St. Catharines
Brant
Kilometres
0
50
100

Figure 3.12 Locations of Modified Kaladar Plots established in 2009 to forecast gypsy moth defoliation for 2010.

In Southern Region, this introduced pest was observed in Aurora, Midhurst, Peterborough and Aylmer districts.

In Aurora District, colonies were detected on Scots pine along Wilcox Road, just off Hwy. 35, Durham Regional Municipality causing trace levels of defoliation. Light defoliation was also recorded in Midhurst District just off Hwy. 10 in the Chatsworth area, Grey County.

In Peterborough District, moderate levels of hatched eggs were found on needles of old Scots pine trees (Figure 3.13) in the community of Stuart Hall. Low larval populations were detected on the same host species along Densmore Road north of the town of Cobourg, where 20% of trees had one to two colonies per tree.

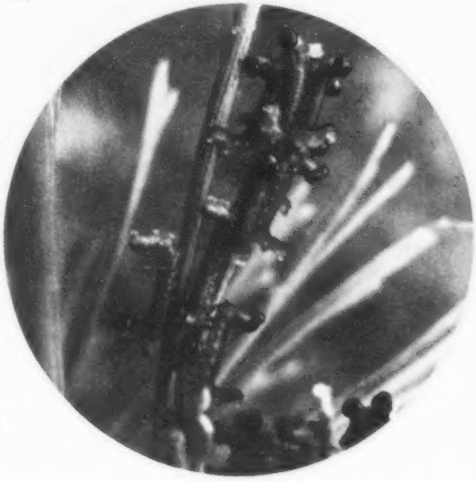


Figure 3.13 European pine sawfly larvae feeding on Scots pine (photo by P. Hodge).

Several observations of European pine sawfly were recorded in Aylmer District in 2009 as this gregarious feeder was found causing light damage on Scots pine and red pine within St. Williams Conservation Reserve.

In Northeast Region, during general ground surveys, European pine sawfly was recorded and collected on St. Joseph Island, Sault Ste. Marie District. Young roadside and private land Scots pine were found to have several colonies of European pine sawfly larvae feeding exclusively on old foliage causing light-to-moderate defoliation along 'A' Line near Kentvale, Sault Ste. Marie District.

European fruit lecanium, *Parthenolecanium corni* (Bouché)

This introduced scale insect is commonly encountered throughout North America. Host species consist of numerous tree and shrub species although detection is often made on oak (*Quercus* spp.), ash (*Fraxinus* spp.) and maple (*Acer* spp.).

For the fourth consecutive year, European fruit lecanium was recorded in high numbers in Parry Sound District and in forest stands in Guelph, Pembroke and Kemptville districts.

In Parry Sound District, high populations were detected on red oak feeding along side hickory leaf roller (*Pseudexentera cressoniana* (Clem.)) contributing to a general decline in growth and vigour. These high populations occurred throughout Muskoka Regional Municipality including the towns of Bracebridge and Huntsville.

In both Pembroke and Kemptville districts, branch die back caused by European fruit lecanium occurred on red oak regeneration along Station Hill Rd, Pembroke District and along Hwy. 511, South of Campbells Rd., Kemptville District.

A small population was also recorded in Millbank, Guelph District feeding on swamp white oak (*Q. bicolor* Willd.) and basswood (*Tilia americana* L.) in a mixedwood forest.

Japanese beetle, *Popillia japonica* Newm.

This common horticultural pest was first introduced into Ontario in 1939 in the Niagara Peninsula, Southern Region. Since that time, it has been recorded feeding on a wide variety of trees, shrubs and herbaceous plants across the region.

Female beetles begin laying groups of 40 to 60 eggs under the soil surface in late July and August. Hatch occurs about two weeks later and young grubs remain underground, feeding on fine rootlets until cold temperatures force them to move deeper in the ground to overwinter. Once spring arrives, grubs resume feeding on grass roots working towards the soil surface to pupate. Adults emerge and fly to nearby trees and shrubs to begin feeding in preparation for mating.

Japanese beetles were observed skeletonizing several hosts including basswood and white elm (*Ulmus americana* L.) across Aylmer and Guelph districts. Dense populations were recorded causing severe defoliation of basswood in Springbank Park, London, and Charlotteville Township, Norfolk County, both in Aylmer District.

European woodwasp, *Sirex noctilio* F.

This invasive forest pest, native to Europe, Asia, and northern Africa has been a serious pest of hard pines where it has been introduced into the southern hemisphere in South Africa, South America, Australia, and New Zealand. It was first collected in North America in 2004 and in Ontario in 2005.

With scientific and diagnostics support from the Canadian Forest Service , and with financial support from the Canadian Food Inspection Agency, the OMNR has conducted surveys since 2005 to delineate the range of this introduced wood wasp in Ontario.

The focus of the 2009 survey was to determine the northern extent of European woodwasp in Ontario. The survey consisted of a 16 week trapping period using 12-unit Lindgren funnel traps baited with a 70:30 blend of α and β-pinene. Collections began the first week of July and ended on the last week of October. Trapping sites were established in unmanaged, over-stocked pine stands with a low or mild level of stress. These pine stands were located along Hwy. 17 from Chalk River to Sault Ste. Marie with traps also located in the Thunder Bay and Fort Frances area (Figure 3.16).

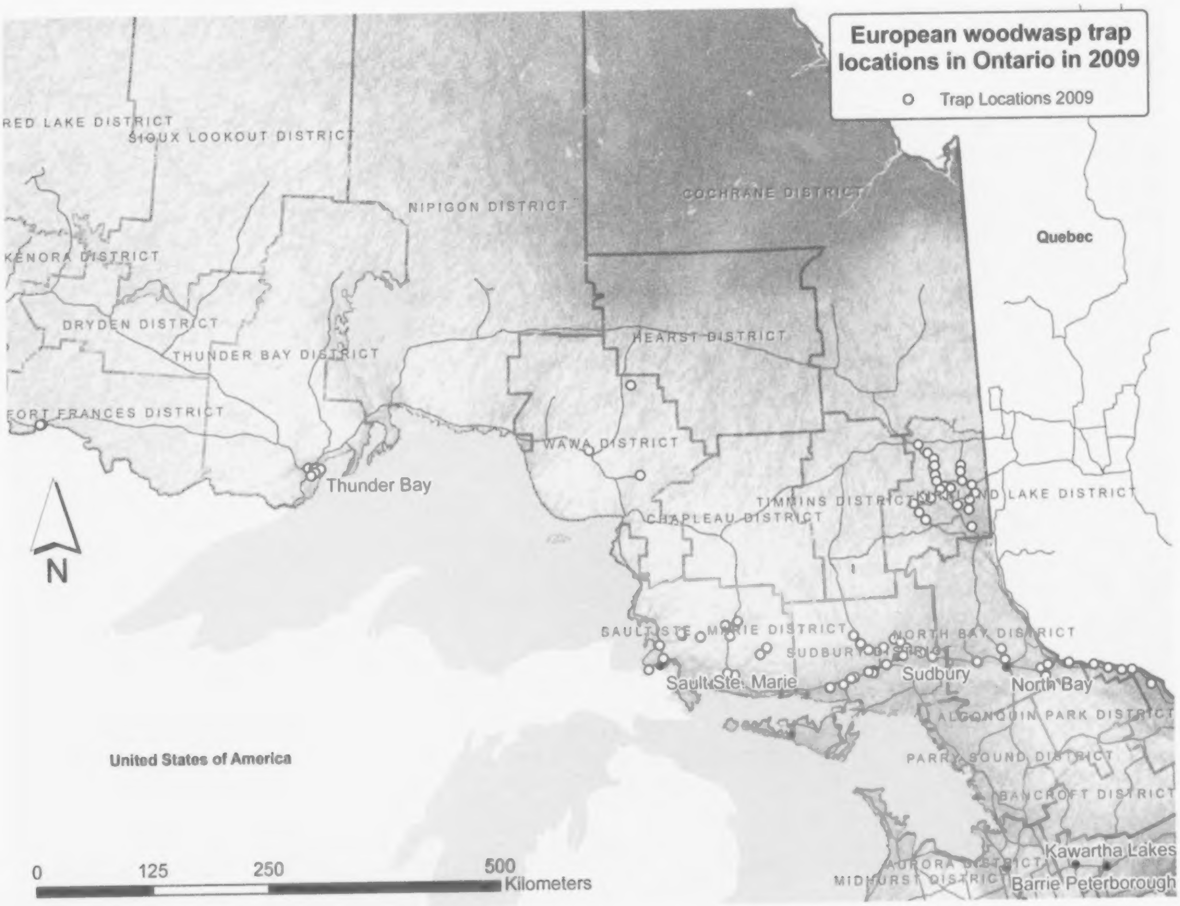

European woodwasp trap locations in Ontario in 2009
○ Trap Locations 2009
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
COCHRANE DISTRICT
Quebec
KENORA DISTRICT
DRYDEN DISTRICT
THUNDER BAY DISTRICT
HEARST DISTRICT
FORT FRANCES DISTRICT
WAWA DISTRICT
Thunder Bay
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
CHAPLEAU DISTRICT
N
SAULT STE. MARIE DISTRICT
NORTH BAY DISTRICT
SUDBURY DISTRICT
Sault Ste. Marie
Sudbury
North Bay
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
BANCROFT DISTRICT
United States of America
0
125
250
500
Kilometers
AURORA DISTRICT
MIDHURST DISTRICT
Kawartha Lakes
Barrie
Peterborough

Figure 3.16 Trapping locations for European woodwasp in Ontario in 2009.

There were 356 siricids (woodwasps) caught in the 2009 survey, none of which were *S. noctilio* (Table 3.3). Lack of trap captures however do not prove that populations do not exist north of the known distribution. Unfavourable weather in the form of rain, hail, overcast skies and cooler temperatures may have played a role in the low total number of siricids captured.

Table 3.3 Total number of siricids caught during the 2009 European woodwasp survey.

Insect Name	Total Number of Specimens	Number of Sites (n=82)	Date of First Capture	Date of Last Capture
Sirex edwardsii	32	17	09-Sep	11-Oct
Sirex nigricornis	129	47	01-Sep	11-Oct
Sirex nr juvencus	40	18	14-Aug	29-Sep
Sirex nr juvencus or cyaneus	1	1	09-Sep	29-Sep
Urocerus albicornis	24	17	04-Jul	29-Aug
Urocerus cressoni	130	59	29-Jul	13-Oct
Sirex noctilio	0	0	N/A	N/A

In previous surveys, *S. noctilio* had been detected in 25 jurisdictions, including the counties of Hastings, Nipissing, Bruce, Dufferin, Durham, Elgin, Grey, Norfolk, Huron, Kent, Lambton, Leeds & Grenville, Middlesex, Niagara, Northumberland, Peterborough, Prince Edward, Simcoe, Waterloo, and Wellington. Detections were also made in the Township of Tehkummah on Manitoulin Island and in the regional municipalities of Halton, Muskoka, Peel, and York.

Pine shoot beetle, *Tomicus piniperda* (L.)

Pine shoot beetle (PSB) is native to Europe, North Africa and Asia and was first detected in North America in Ohio in 1992. Shortly thereafter, it was discovered in Ontario in 1993. This insect attacks all species of pines. The adult beetles tunnel into the shoots, causing shoot mortality. The trunk of the tree is also attacked when the adults invade the trunk, mate in the cambial layer and then lay eggs. The larvae then tunnel just under the bark. While this larval feeding can result in whole tree mortality, it is usually only successful if the tree is under great stress.

Detection surveys in Ontario have since confirmed PSB populations across Southern Region. Federal quarantines have been placed on the movement of pine material from regulated areas to slow the spread of this pest.

Since 1998, trace population levels have been detected along the southern edge of Northeast Region, specifically near Iron Bridge, Blind River, North Bay and Sturgeon Falls. So far in Ontario, tree mortality has mostly been limited to pine trees under stress from off-site planting, drought, flooding, poor dominance, attack by other insects or root rot, or other factors. It is not yet known whether PSB poses a significant threat to jack pine stands of northern Ontario. Stressors such as fire, drought, or defoliation by insects such as jack pine budworm or pine false webworm may make these stands vulnerable to PSB once the insect arrives in the north. Therefore, since 1999 the OMNR has conducted an annual detection and containment program to slow the spread of PSB into the stands of Northeast Region.

In 2009, a detection program was once again conducted by forest health monitoring staff. The goals of this detection program were: to confirm new positive results found in 2008; help detect movement of this insect between stands; and to monitor log yards and sawmills in the north and west sections of the province in the event that material moved to and from these areas may introduce this pest to previously non-infested areas. The detection effort consisted of 66 12-unit Lindgren funnel traps baited with Myrtenol-trans-Verbenol deployed within three general areas across the province.

The first of these areas was along Hwy. 17 from Sault Ste. Marie to the Ottawa Valley. The second was along travel corridors between Hwy. 417, Ottawa Valley and Hwy. 69, Parry Sound area. This general area consisted of: Hwy. 11 south from North Bay to Bracebridge; Hwy. 60, through Algonquin Park; county roads between Kemptville and Carleton Place; Hwy. 518 between Huntsville and Parry Sound; and Regional Rd 118 between the town of Bracebridge and Hwy. 69 at Foots Bay.

The final area of interest was Sault Ste. Marie north and west to Fort Frances. Trap locations to the west of Sault Ste Marie included White River, Hornepayne, Hearst, Thunder Bay and Fort Frances.

Adult pine shoot beetles were collected and positively identified at 15 of 66 locations (Figure 3.17).

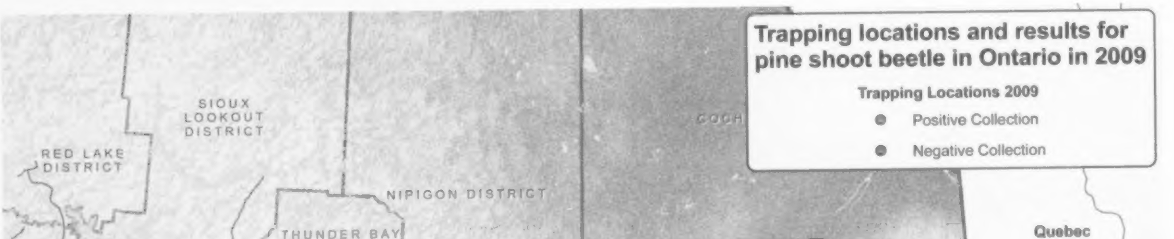

Trapping locations and results for pine shoot beetle in Ontario in 2009
Trapping Locations 2009
● Positive Collection
● Negative Collection
SIOUX LOOKOUT DISTRICT
RED LAKE DISTRICT
COCH
NIPIGON DISTRICT
THUNDER BAY DISTRICT
KENORA DISTRICT
Quebec
DRYDEN DISTRICT
HEARST DISTRICT
FORT FRANCES DISTRICT
Thunder Bay
WAWA DISTRICT
TIMMINS DISTRICT
CHAPLEAU DISTRICT
KIRKLAND LAKE DISTRICT
N
SAULT STE MARIE DISTRICT
Sault Ste. Marie
Sudbury
SUDBURY DISTRICT
North Bay
NORTH BAY DISTRICT
PEMBROKE DISTRICT
ALGONQUIN PARK DISTRICT
United States of America
PARRY SOUND DISTRICT
BANCROFT DISTRICT
Kawartha Lakes
Barrie
Peterborough
MIDHURST DISTRICT
0
125
250
500
Kilometers

Figure 3.17 Trapping locations and results for pine shoot beetle in Ontario in 2009.

Two of the positive collections were located in previously non-infested areas located along County Rd 43 near the eastern junction of Rideau River Rd, west of Merrickville, Lanark County and along Gough Rd. south of Manotick Station, southeast of Ottawa, Regional Municipality of Ottawa-Carlton.

In addition to the detection survey, a containment program is also conducted annually. All sites selected for the containment program are concentrated along the leading edge of the infestation as indicated by the previous year's detection survey. This includes sites near Bracebridge, with a northerly extension along Hwy. 17 to Espanola, Sudbury District and Iron Bridge, Sault Ste. Marie District. This involves the cutting and stacking piles of 3 to 5 Scots pine logs 1 m long that will act as bait logs for adult PSB at each site. Logs are cut and placed during mid-March and picked up in late May. Upon retrieval the logs are placed in sealed containers and transported to the Peterborough area where PSB is already well established. After transport the bark is removed and data on number of galleries is collected. The goal of this program is to reduce the population of PSB to prevent it from spreading from the edge of the infested area into northeastern Ontario. For 2009, 18 of 21 trap-log sites contained PSB Adults.

Introduced basswood thrips, *Thrips calcaratus* Uzel

Populations of this exotic pest are often found feeding alongside the native basswood thrips (*Sericopthrips tillae* Hood) causing severe defoliation and branch die back of American basswood.

In 2009, high populations continued to cause problems in Peterborough District where it has been recorded for the past 5 years. These populations however, seem to be on the decline as moderate-to-severe defoliation was observed in only one location along Hwy. 7 at Monaghan Parkway, just outside the town of Cavan.

Euonymus webworm, *Yponomeuta cagnagella* Hbn.

First introduced into Ontario in 1967, euonymous webworm is a primary pest of its namesake shrub host, *Euonymous* spp.

Female moths lay eggs in mid to late-July on twigs and branches of host species, hatching 2 to 4 weeks later. No further activity occurs while newly-hatched larvae remain under hardened eggshells until the following year. With the onset of warmer spring weather, larvae begin to construct small webs and feed gregariously on newly-developed leaves. As larvae mature and need to forage for food, these webs coalesce and often cover branches or entire shrubs. Soon after this feeding is complete, larvae form a cocoon in which the larvae pupate and emerge as adult moths by late June.

In 2009, small populations were noted in Point Pelee National Park on understory *Euonymous europaus* L. These populations were found to be causing 100% defoliation of all hosts located in the area.

Forest Diseases

White pine blister rust, *Cronartium ribicola* J.C. Fisch.

This introduced pathogen is found throughout the range of eastern white pine (*Pinus strobus* L.) in Ontario. The disease, which is of Eurasian origin, arrived in the early 1900s causing branch and whole tree mortality. Although certain silvicultural practices can mitigate the effects of this disease and aid in stand establishment, white pine blister rust continues to be a major challenge in regenerating white pine in Ontario (Figure 3.18).

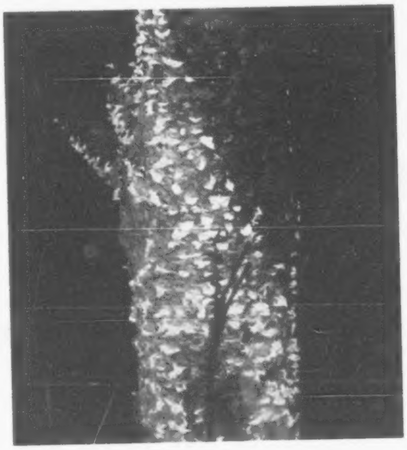


Figure 3.18 Characteristic fruiting bodies of white pine blister rust on a juvenile tree (Photo by E. Cleland).

White pine blister rust is regularly recorded across the province. In 2009 the disease was detected in all three regions. In Northeast Region, signs and symptoms were detected in a historically infected eastern white pine plantation along Ranger Road, Sault Ste. Marie District. High rates of infection were also noted in young eastern white pine plantations and roadside trees in Gurd, Thistle and Lauder townships, North Bay District. In Sudbury District, observations of diseased trees were noted on Manitoulin Island, in the Killarney area and McCarthy Township.

In Northwest Region, several reports of infection were recorded along Burchell Road, Thunder Bay District, in Lake of the Woods (Clearwater Bay) area, Kenora District and on Cedar Narrows road, Fort Frances District.

In Southern Region, white pine blister rust was detected in Pembroke, Midhurst, and Aylmer districts. Collections were made on Tatty Hill Road, Bagot and Blithfield Township; Poplar Lake area, Griffith and Matawatchan Township; and at Petawawa Research Forest, all of which are located in Pembroke District. Further infections were noted on County Road 3, Southgate Township, Grey County, Midhurst District and on several planted white pine at a campground near Embro, Oxford County, Aylmer District.

Dutch elm disease, *Ophiostoma novo-ulmi* (Brasier)

This virulent pathogen of elm (*Ulmus* spp.) was introduced to Ontario in 1946 and has caused severe damage and mortality to infected trees across Ontario.

In 2009, Dutch elm disease was reported in Northwest, Northeast and Southern regions. A higher incidence of severe damage and the disease itself was recorded in many satellite pockets in both Northeast and Northwest regions when compared to 2008 records.

In Southern Region, a very high number of cases were reported across both Aylmer and Guelph districts primarily on juvenile trees. The disease was also detected in many locations throughout Midhurst, Aurora and Parry Sound districts.

Several elm trees in Northeast Region including Sault Ste. Marie, Sudbury and North Bay districts, were identified with Dutch elm disease. In the city of Sault Ste. Marie, elm trees of all ages showed signs of infection which in some cases resulted in mortality. Branch and whole tree mortality also occurred in several locations throughout Sudbury and North Bay districts. In recent years, a number of semi-mature and mature white elm in Bonfield and Commanda townships, North Bay District have been lost to this disease with additional trees identified as infected, lining streams and rivers along Hwy. 17 near Verner, North Bay District.

In Northwest Region, Dutch elm disease was evident in the southeast corner of Fort Frances District. Many elm trees along Hwy. 11, west of the town of Fort Frances, have succumbed to the disease (Figure 3.19) in recent years with several more displaying signs and symptoms including wilted, shrivelled, and chlorotic leaves.

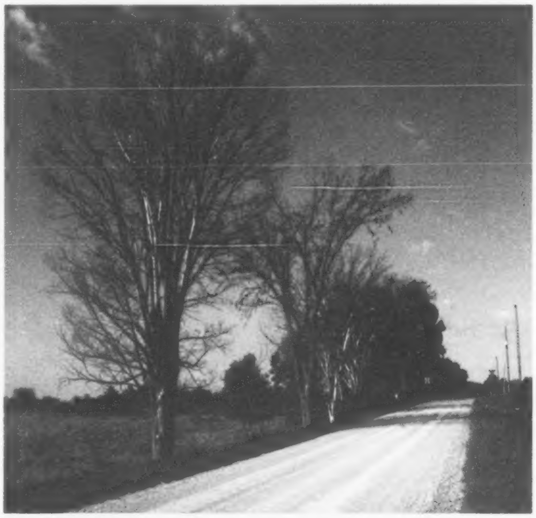


Figure 3.19 Mortality to white elm caused by Dutch elm disease. (Photo by J. Jamieson).

Butternut canker, *Sirococcus clavigignenti-juglandacearum* V.M.G. Nair, Kostichka & Kuntz

Butternut (*Juglans cinerea* L.) decline and mortality caused by butternut canker has been reported across the range of butternut in North America. As a result of this canker, butternut has been placed on both the national and provincial endangered species lists. This fatal disease is thought to have been introduced, as it was first detected in 1969 and identified in 1979 in the state of Wisconsin. The first detection of the disease in Ontario occurred in 1991, however, dendrochronology has indicated the disease may have been affecting trees in Ontario for at least 18 years prior to its detection and confirmation.

In 2008, a provincial survey was conducted with an exploratory survey of 60 potential butternut monitoring sites. At least one healthy butternut tree was found at 17 of the 60 sites surveyed. This is a long term study that examines trends in butternut health and regeneration, and the impacts of the canker. Although no re-measurement data is available for 2009 , further data is expected to become available in future years when the survey is repeated.

To help protect and promote butternut in Ontario, a recovery plan has been undertaken in the province. Recovery efforts have been put forth by the Forest Health and Silviculture Section, Southern Region District MNR staff, the Forest Gene Conservation Association, the Rideau Valley Conservation Authority, local stewardship councils and private landowners (Figure 3.20). The recovery efforts included:

- Increasing landowner education
- Developing a tree health assessment system which supports recovery efforts and the Endangered Species Act 2007 Butternut Health Assessor Protocol
- Developing silviculture guidelines and demonstrations
- Performing DNA testing for hybridity by OMNR-Ontario Forest Research Institute
- Providing seed forecasting, collection and stock production
- Delivering landowner tree planting programs
- Establishing the Eastern Ontario Butternut Archive

Figure 3.20 A butternut canker workshop in correlation with recovery efforts and Butternut Health Assessor Protocol in Southern Region (photo by P. Hodge).

Northwest Region

RED LAKE
SIOUX LOOKOUT
NIPIGON
Northwest Region
KENORA
DRYDEN
FORT FRANCES
THUNDER BAY
N
Kilometers
0 50 100 200 300

L. Rowlinson[1], L. Malley[1], T. Straight[1], and S. Young[1]

[1] Ontario Ministry of Natural Resources, Forest Management Branch, Forest Health & Silviculture Section

SECTION

4

FOREST INSECTS

Fall cankerworm, *Alsophila pometaria* (Harr.)

Fall cankerworm is a common pest that occurs occasionally in large numbers throughout its native range in Canada (from Nova Scotia to Alberta). In northwestern Ontario, this insect is typically more of a problem with ornamental and windbreak trees as opposed to forest stands because the insects are more commonly found in these situations. (Figure 4.1).

For the second year in a row, this defoliator of many hardwood tree species was observed causing varying levels of defoliation in the towns of Fort Frances and Kenora. The insect was found feeding on all age classes of Manitoba maple (*Acer negundo* L.) silver maple (*Acer saccharinum* L.) ash (*Fraxinus* spp.), basswood (*Tilia americana* L.) and cherry (*Prunus* spp.) trees. The heaviest defoliation of 100% was recorded on several mature Manitoba and silver maples that were growing in Legion Park on Lillie Avenue in the town of Fort Frances, however varying levels of defoliation could be found wherever host trees were located in the town.

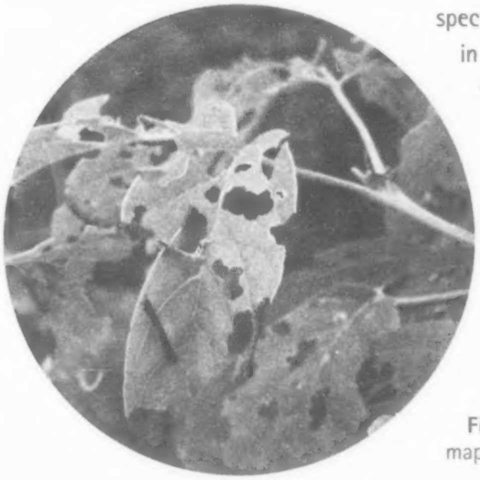


Figure 4.1 Fall cankerworm larvae feeding on Manitoba maple, Kenora District (photo by L. Rowlinson).

Compared to Fort Frances, the towns of Kenora, Dryden, Sioux Lookout and Ignace sustained much lower levels of defoliation in 2009 with only scattered silver and Manitoba maples showing feeding damage by this insect. In most cases, defoliation was less than 50%.

Pinkstriped oakworm, *Anisota virginiensis* (Drury)

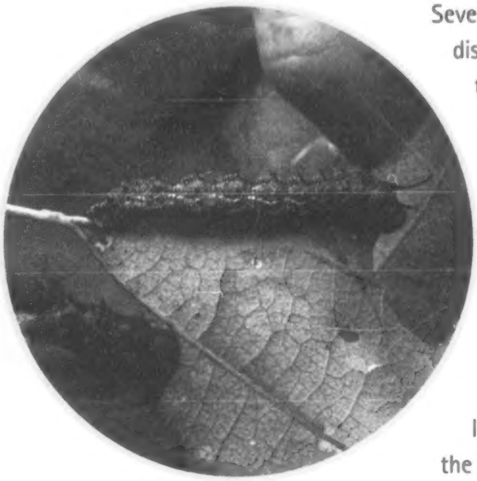


Figure 4.2 Pinkstriped oakworm larva Lake of the Woods, Kenora District (photo by T. Straight).

Severe defoliation caused by pinkstriped oakworm larvae was discovered this season within Kenora District (Figure 4.2). Prior to this discovery pinkstriped oakworm defoliation has not been mapped in Northwest Region within the last 10 years.

Mapped areas of defoliation consisted of small stands of burr oak (*Quercus macrocarpa* Michx.) growing on shallow soil sites located on islands and shorelines scattered throughout the northcentral section of Lake of the Woods. Defoliation by this insect was confined to burr oak, however, the larvae of this insect will feed on other species of oak when available. Oak in Kenora District is typically limited to isolated stands that grow on the shoreline of Lake of the Woods.

Ugly nest caterpillar, *Archips cerasivorana* (Fitch)

This is a common forest insect found in many parts of Canada. It primarily defoliates chokecherry (*Prunus virginiana* L.) trees, however it is also known to feed on pin cherry (*P. pensylvanica* L. f.) and other hardwoods. The insect is easily identified by its nest of foliage covered in silk webbing in which the larvae congregate and feed. In 2009, trace-to-low levels of ugly nest caterpillar defoliation were observed in Northwest Region with defolaition recorded on chokecherry in Thunder Bay and Fort Frances districts.

Cedar leafminer, *Argyresthia* spp.

Cedar leafminer damage this year was observed in an isolated pocket within Fort Frances District at the north end of Pipestone Lake east of Nestor Falls. Eastern white cedar (*Thuja occidentalis* L.) in the area had thin, off colour brown foliage which was later determined to be caused by the cedar leafminer. Significant foliar damage was reported within the isolated area with 60 to 75% of foliage damaged on most trees.

Pine resin midge, *Cecidomyia resinicola* (Osten Sacken)

Damage from this insect was detected in 10 year old jack pine (*Pinus banksiana* Lamb.) plantations within Webb Township of Dryden District. Population levels were nil-to-low in these plantations with 0 to 25.9% of trees affected.

Eastern larch beetle, *Dendroctonus simplex* (LeC.)

In Northwest Region, several pockets of tamarack (*Larix laricina* (Du Roi) K, Koch) mortality were mapped around the town of Rainy River in Fort Frances District. Pockets of dead and dying larch trees were mapped within the area west of Fort Frances, as far as Rainy River and as far north as Mathieu Township on the south eastern shore of Lake of the Woods. Along the southern limit of the area of damage, Blue, Dilke, Nelles and Worthington townships all had pockets of tamarack mortality. Affected pockets were mostly located on the edge of swamps or harvested areas. Investigations revealed heavy infestations on most tree stems with galleries containing both adults and larvae. Due to high amounts of precipitation, the ground water levels were abnormally high in many of the affected areas during 2009 which acted as a stress factor for these trees, weakening their natural defence mechanisms against this insect.

Ash flowergall mite, *Eriophyes fraxiniflorus* Felt.

In Northwest Region, evidence of past occurrences of the ash flowergall mite was common in 2009. Affected trees were easily distinguishable since heavy attacks by these mites caused the tree to abort production of male flowers, resulting in the shrivelled black masses hanging on the trees. During 2009, black ash (*Fraxinus nigra* Marsh.) was the most commonly affected species. Ash in the Northwest typically grows in small stands in swampy boreal wetland areas. Affected stands of black ash typically had a high percentage of trees affected at varying levels.

Eastern pine shoot borer, *Eucosma gloriola* Heinr.

This beetle was commonly found among young, spaced jack pine in Dryden District, Northwest Region. Population levels were generally considered low, affecting between 15 and 24% of planted jack pine. Damage from this pest is usually considered low because the insect affects only current year's growth. However, damage is considered severe when it affects the terminal leader. A range of 5 to 18% of plantation jack pine trees were severely damaged by this pest within Skey and Webb townships and off of Vaughn Road (near the Sunstrom intersection), Doreen Road (southwest of Raleigh Lake) and Glider Road (at the North Road Intersection) within Dryden District.

Fall webworm, *Hyphantria cunea* (Drury)

This pest was observed in small colonies on individual trees throughout Dryden, Sioux Lookout and Thunder Bay districts. Severe defoliation was reported on small trees but larger trees had trace to low levels of defoliation. The affected species included pin cherry, choke cherry, alder (*Alnus* spp.) and white birch (*Betula papyrifera* Marsh.). Fall webworm has been reported for the last several years in Northwest Region. Population and defoliation levels for this insect remained relatively low despite the fact that it was noticeable throughout the region.

Willow flea weevil, *Isochnus rufipes* (LeC.)

A heavy infestation of willow flea weevil affected ornamental willow (*Salix* spp.) trees throughout the town of Ignace, Dryden District. The larvae feed between June and September and produce blotch mines between the upper and lower surfaces of the leaf, giving a dark brown blistered appearance to the foliage of affected host individuals (Figure 4.3).

Figure 4.3 Feeding damage caused by willow flea weevil, (photo by L. Rowlinson).

White spotted sawyer beetle, *Monochamus scutellatus* (Say)

During the summer of 2009 Northwest Region had 16,874 ha of jack pine mortality caused by the whitespotted sawyer beetle. Affected districts include: Red Lake, Sioux Lookout, Dryden, Thunder Bay and Nipigon (Figure 4.4 Map). The magnitude of the damage and mortality in 2009 is abnormally high; populations have built up over the past several years due to the abundant amount of brood material created from several blow-down events that have occurred annually since 2005, exasperated further by drought-like conditions across the entire region in 2006 and 2007.

Red Lake District had 693 ha of damage mapped between McKenzie Bay on the northwest shore of Lac Seul and Goodall Township to the north.

Sioux Lookout District was severely affected by this insect during 2009 with pockets of mortality totalling 9,873 ha. Affected areas were generally in close proximity to recent cutting operations as well as near older centers of weather-damaged trees. The largest concentration of damage was between Anenimus and Breechin bays on Lac Seul northwest of the town of Sioux Lookout, extending east to the district boundaries of Sioux Lookout and Thunder Bay.

Dryden District had pockets of mortality totalling 3,783 ha ranging from Fawcett Lake in the north, to Mennin Lake in the south east and north east to the Sioux Lookout and Thunder Bay district boundaries.

Nipigon District also had significant levels of mortality (2,042 ha). Thunder Bay had 483 ha of mortality as well. The major areas of damage were near the town of Jellico, Metionga Lake, an area south of Kawaweogama Lake, as well as a few small pockets east and south east of Graham. In Nipigon District, this outbreak has been ongoing for 3-4 years and it is believed that some of the initial mortality may have been caused by drought.

In all other instances of jack pine mortality across the region, small, upper branches of affected host trees showed signs of sawyer beetle adult feeding. Feeding by adult beetles resulted in the desiccation and eventual death of the branches. Larval activity was also present within sampled trees. Feeding by sawyer beetle larvae was the main cause of

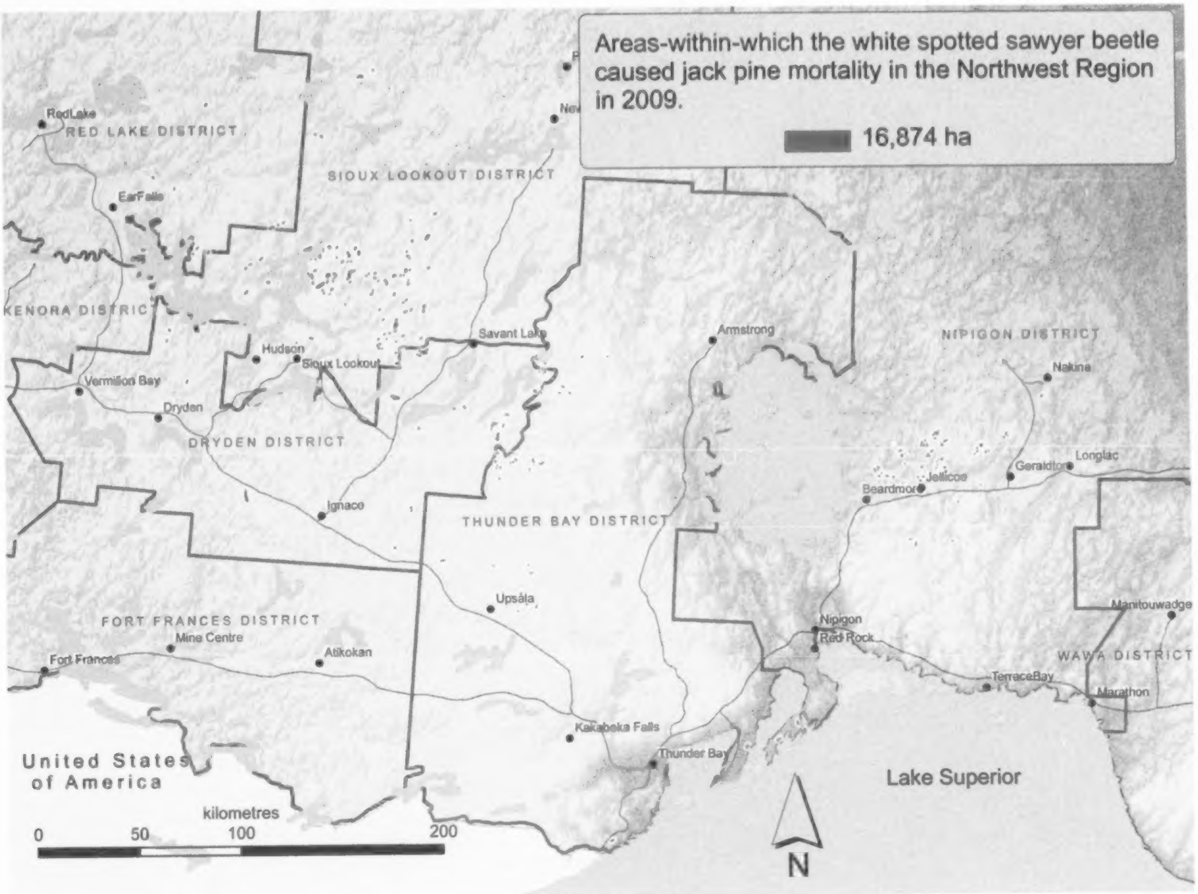

Areas-within-which the white spotted sawyer beetle caused jack pine mortality in the Northwest Region in 2009.
16,874 ha
Red Lake
RED LAKE DISTRICT
Ear Falls
SIOUX LOOKOUT DISTRICT
KENORA DISTRICT
Hudson
Sioux Lookout
Savant Lake
Armstrong
NIPIGON DISTRICT
Nakina
Vermilion Bay
Dryden
DRYDEN DISTRICT
Ignace
THUNDER BAY DISTRICT
Beardmore
Jellicoe
Geraldton
Longlac
Upsala
Manitouwadge
FORT FRANCES DISTRICT
Mine Centre
Fort Frances
Atikokan
Nipigon
Red Rock
WAWA DISTRICT
Terrace Bay
Marathon
Kakabeka Falls
Thunder Bay
United States of America
Lake Superior
kilometres
0
50
100
200
N

Figure 4.4 Areas-within-which whitespotted sawyer beetle caused jack pine mortality in Northwest Region in 2009.

mortality to host trees. Larvae feed on the live inner layers of the bark and eventually the tree is girdled and transpiration within the tree is disrupted.

Aspen leafblotch miner, *Phyllonorycter ontario* (Free.) and *P. nipigon* (Free.)

In 2009, aspen leaf blotch miner (*Phyllonorcycter ontario* Free.) on trembling aspen (*Populus tremuloides* Michx.) (Figure 4.5) and P. nipigon (Free.) on balsam poplar (*Populus balsamifera* L.) were widespread throughout Red Lake, Dryden and Sioux Lookout districts during the late summer. These leaf-mining insects were found to be affecting all ages of host trees. In late summer, affected leaves were browning and abscising much earlier than normal giving affected stands a fall-like appearance.

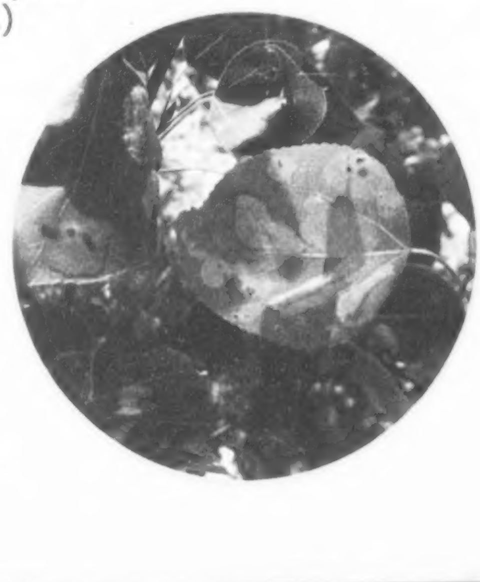


Figure 4.5 Aspen leafblotch miner damage on trembling aspen, Red Lake District (photo by S. Young).

Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.)

Defoliation caused by this insect was visible during 2009 in the Fort Frances and Kenora districts on white spruce (*Picea glauca* Moench Voss) along the edges of most of the major travel corridors (Figure 4.6).

This sawfly was sampled from the Cedar Narrows Rd. west of Hwy. 502 while causing severe defoliation with levels up to 90% on white spruce trees at the roadside. Evidence of severe defoliation by this insect was also present within the town of Fort Frances on ornamental Colorado blue spruce (*Picea pungens* Engelm.).

Figure 4.6 Yellowheaded spruce sawfly larvae feeding on white spruce, Fort Frances District (photo by L. Rowlinson).

White pine weevil, *Pissodes strobi* (Peck)

Plantation surveys in 2009 detected white pine weevil as one of the main agents causing damage to regenerating jack pine across much of Northwest Region. This insect is commonly seen during plantation surveys later in the growing season in August and September. White pine weevil is especially destructive within plantations because it kills the leader of the tree as well as up to two subsequent years of growth. Adults feed on the inner tissues of the bark and lay eggs in feeding holes. Once the eggs hatch, the larvae feed downward and eventually sever the conductive tissues. This causes the top of the tree to wither and turn brown.

Spruce bud midge, *Rabdophaga swainei* Felt

This insect affected a relatively high number of trees (30-60%) in black spruce (*Picea mariana* (Mill.) BSP) plantations within Van Horne and Brownridge townships, Dryden District. Large numbers of spruce trees in the plantations had at least one lateral bud damaged by this insect, with many trees having multiple occurrences. This insect caused severe damage in 6 to14% of the surveyed trees in plantations by affecting the terminal bud of the main leader.

Pitch-nodule maker, *Retinia albicapitana* (Busck)

Trace-to-low levels of defoliation caused by this insect were observed during jack pine plantation surveys on Vaughn Road (near the Sunstrom intersection), Doreen Road (southwest of Raleigh Lake) and Glider Road (at the North Road Intersection) areas. Some severe damage was reported with the nodule being located on the main stem of the tree. Nodules that occur on the main stem are considered more severe because they can cause breakage at the weakened point of infestation , resulting in a loss of height growth.

Redhumped caterpillar, *Schizura concinna* (J. E. Smith)

The redhumped caterpillar was found to be defoliating trees in Red Lake, Dryden and Sioux Lookout districts late in August of 2009 (Figure 4.7).

Throughout the affected areas, medium-to-high levels of defoliation were observed primarily on willow (*Salix* spp.).

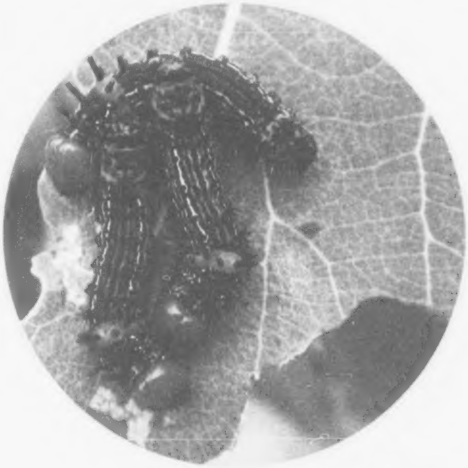


Figure 4.7 Redhumped caterpillar on aspen, Sioux Lookout District (photo by L. Rowlinson).

Forest Diseases

Cool damp weather conditions such as those experienced for much of the summer of 2009 in Northwest Region resulted in an increased occurrence of fungal pathogens in the forest.

Ink spot of aspen, *Ciborina whetzelii* (Seaver) Seaver

Ink spot of aspen is a foliar disease that eventually turns foliage a tan/brown colour. The disease is evident by tan areas on the leaf surrounded by concentric white zones. As the season progresses the tan spots on the leaf grow in size and eventually cover the entire leaf. Dark brown to black elliptical bodies several millimetres in length will then form over the surface of the leaf and eventually fall out and leaving holes in the leaves. This disease can affect the entire crown of the tree or even just small portions.

Varying levels of infection by this disease were found across Northwest Region this season. Aspen trees with moderate levels of the disease were found in Thunder Bay District near Graham Road and on Hwy. 527. This disease was also recorded in Fort Frances District on Hwy. 502 near Vedette Lake. Aerial surveys in Northwest Region recorded the following areas of damage: Dryden District (819 ha), Fort Frances District (337 ha), Kenora District (102 ha), Nipigon District (184 ha), Red Lake District (90 ha), Sioux Lookout District (166 ha) and Thunder Bay District (140ha).

Spruce needle rust, *Crysomyxa ledi* (Alb. & Schwein.) de Bary var. *ledi*

Spruce needle rust was common throughout Northwest Region in 2009 on both black and white spruce. Samples of this disease were collected near Sapawe northeast of the town of Atikokan for confirmation of identification . From the air, this disease was highly visible throughout the region. While the orange discolouration of the needles is quite noticeable, typically enough foliage on the tree remains unaffected so that there is limited or no impacts to tree vigour.

Linospora leaf blight, *Linospora tetraspora* G.E. Thomps.

Linospora leaf blight was widespread in 2009 on balsam poplar across all districts in Northwest Region. Wet and cool weather in the summer of 2009 increased the development and spread of this pathogen.

Septoria leaf spot, *Mycosphaerella populorum* G.E. Thomps and *Septoria betulae* Pass.

Two separate species of fungus exist which share the common name of septoria leaf spot. Each species occurs on a different species of host tree. Mycosphaerella populorum infects native aspen trees such as balsam poplar and trembling aspen, while Septoria betulae infects birch in Ontario.

With the weather conditions of 2009 foliar diseases such as septoria leaf spot on balsam poplar was wide spread across Northwest Region. Septoria leaf spot originates from leaf litter on the ground that was infected during the previous growing season. If conditions are right new foliage will become infected and the disease will spread to nearby foliage throughout the summer.

On white birch (*Betula papyrifera* Marsh.) Septoria leaf spot brings on early leaf senescence, making affected host trees turn bright yellow in appearance. Early in the season, the disease infects shaded leaves in the lower parts of the crown and gradually works its way into the upper crown later in the season. As a result, the pathogen was barely visible in late June, but was highly visible and widespread by the time aerial surveys were concluded in mid-August in the northwest. This disease was reported in Dryden, Sioux Lookout, Red Lake, Kenora and Fort Frances districts.

Anthracnose, (*Anthracnose* spp.)

Anthracnose is a fungus that affects the foliage of many deciduous tree species in Northwest Region. The fungi overwinter in the leaf litter and infect new developing foliage in the spring. Foliage affected by this pathogen develops wrinkled and discoloured blotches as leaf tissues die.

Various anthracnose species have been recorded in Northwest Region during 2009. High levels of anthracnose infection was recorded on balsam poplar in the Black Sturgeon area of Nipigon District. Recorded damage totalled 262 ha.

Birch anthracnose (*Discula betulina* (Westend.) Arx) was found on white birch trees along Black Sturgeon Road within Nipigon District. In addition, ash anthracnose (*Discula fraxinea* (Peck) Redlin & Stack) was found on green ash (*Fraxinus pennsylvanica* var. *subintegerrima* (Vahl) Fern.) trees in Thunder Bay within the James Street vicinity.

Shoot blight of aspen, *Venturia macularis* (Fr.:Fr.) E. Müll. & Arx

In early June 2009, collections of this disease were gathered from several roadside specimens along Hwy. 11 on the southern end of Fort Frances District. In addition to these collections, observations were made of similar symptoms appearing at many locations throughout the entire Northwest Region. Samples confirmed the issue was shoot blight of aspen. Shoot blight commonly affects young aspen trees, however in 2009, it was observed killing the tender young growth on the top of some trees 8 metres tall along Hwy. 502 within Fort Frances District. Recent cutovers where aspen suckers were growing rapidly and roadside aspen regeneration showed a high incidence of infection by this disease. In some areas nearly 100% of 2 metre tall aspen trees were affected.

Comandra blister rust, *Cronartium comandrae* Peck

Comandra blister rust infects jack pine trees of all ages and can result in mortality for younger trees or die-back to branches in the crown of mature trees. Cankers are most noticeable in the spring, when the orange spores are present. Canker areas produce large amounts of resin and swelling often occurs. Squirrels tend to feed on the fruiting bodies produced and as a result the site may have a fresh wound caused by squirrel feeding. This disease was found in Sioux Lookout District on jack pine.

Forest Abiotics

Ice Damage

On March 24, 2009, the north shore of Lake Superior experienced large amounts of freezing rain which resulted in 9,808 ha of damage to area forests. Within this area, damage consisted of bent and broken stems, as well as broken tops and branches. This damage was visible between Cavers Bay, Lake Superior, Yesno Township, east to Lunch Lake in Syine Township.

During aerial surveys conducted in late July the main body of the damage was mapped from Whitesand Lake Road, Killraine Township and was continuous for approximately 12 km east to Hays Lake within the municipality of Terrace Bay. This pocket extended north of Hwy. 17 to North Cook Lake in Priske Township and as far south as the Canadian Pacific rail line in both Killraine Township and the Township/Municipality of Schreiber (Figure 4.8).

The remainder of the damage consisted of scattered pockets of light-to-severe damage located and continued further to the north and east of the town of Terrace Bay. One pocket of damage followed along the eastern shore of the Aquasabon River, while two smaller pockets flowed along the north side of hwy. 17 as far as the Sister Lakes. Damage was also recorded north of the Aquasabon River along the eastern shores of Sand Lake and Lower Lake.

Also in Northwest Region, three small pockets of ice damage totalling 225 ha, was mapped in the southeastern corner of Thunder Bay District. Pockets of damage were mapped north of Hwy. 17, near Penassen Lakes, Shuniah Township; north of Magone Road near Walkinshaw Lake; and one north of Beck. Within this area, all tree species were affected with the most visible damage being to deciduous species. With these additions, total area of ice damage in Northwest Region during 2009 was 9,808 ha.

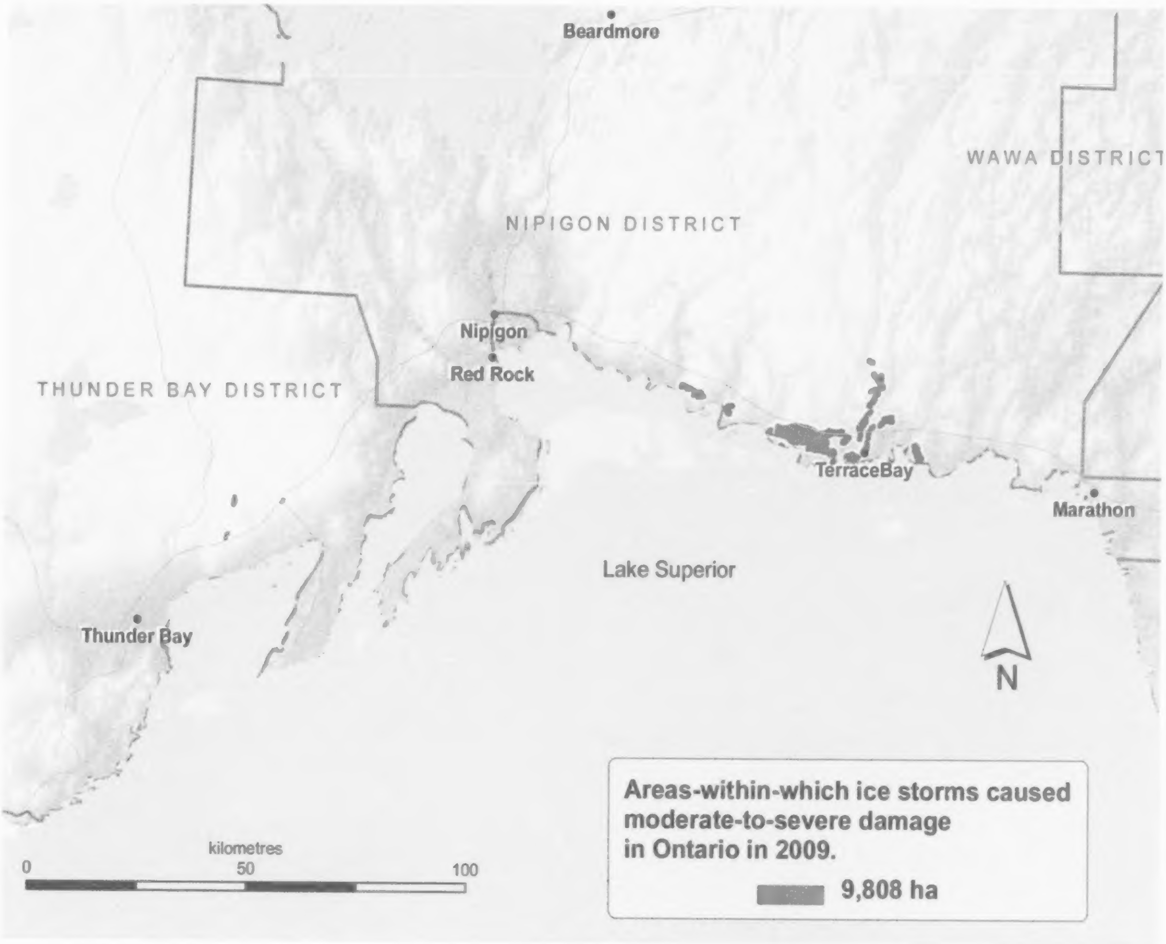

Beardmore
WAWA DISTRICT
NIPIGON DISTRICT
Nipigon
Red Rock
THUNDER BAY DISTRICT
TerraceBay
Marathon
Lake Superior
Thunder Bay
N
Areas-within-which ice storms caused moderate-to-severe damage in Ontario in 2009.
9,808 ha
kilometres
0
50
100

Figure 4.9 Areas-within-which ice storms caused moderate-to-severe damage in Ontario in 2009.

Northeast Region

COCHRANE
Northeast Region
HEARST
WAWA
CHAPLEAU
TIMMINS
KIRKLAND LAKE
SAULT STE MARIE
SUDBURY
NORTH BAY
Kilometers
0 50 100 200 300

M. Francis[1], W. Byman[1], J. Jamieson[1], A. Zeppa[1], and D. Rowlinson[1]

[1] *Ontario Ministry of Natural Resources, Forest Management Branch, Forest Health & Silviculture Section, Sault Ste. Marie*

FOREST INSECTS

Ugly nest caterpillar, *Archips cerasivorana* (Fitch)

In Northeast Region, numerous nests of ugly nest caterpillar were observed on the north end of St. Joseph Island in Sault Ste. Marie District in 2009 (Figure 5.1).

Roadside chokecherry (*Prunus virginiana* L.) trees on the north end of A Line and 10th Sideroad were infested with this defoliator. Although in this case they were found on chokecherry trees, they will also feed on pin (*P. pensylvanica* L. f.) or black cherry (*P. serotina* Ehrh.) trees.

Larvae feed and pupate in the nest from May to September. The moths emerge from the nest and lay eggs on the main stem or larger branches where they will overwinter until the following spring (Figure 5.2).

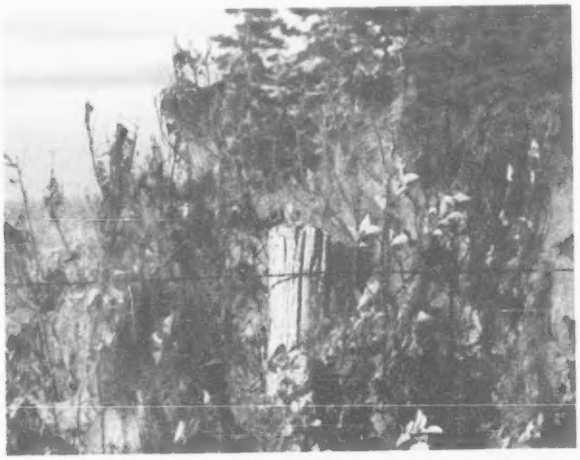


Figure 5.1 Nests spun by the ugly nest caterpillar on St. Joseph Island Sault Ste. Marie District (photo by M. Francis).

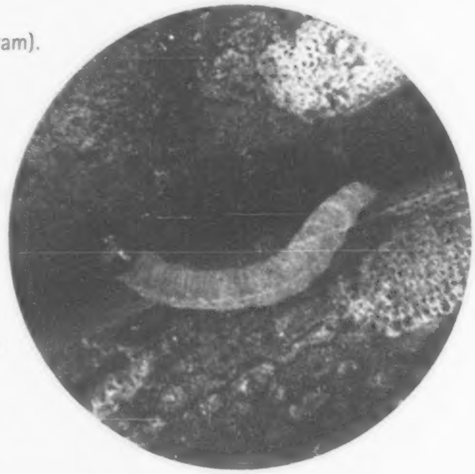


Figure 5.2 Ugly nest caterpillar and eggs (photo by W. Ingram).

Oak leafshredder, *Croesia semipurpurana* (Kft.)

The oak leafshredder is an early defoliator and historically has caused widespread defoliation throughout the range of red oak in Ontario. Overwintering eggs hatch in early May and larvae begin feeding on young developing foliage. This early feeding produces a shot-hole or shredded effect on the leaves.

In 2009, light defoliation was recorded in a red oak (*Quercus rubra* L.) stand on Landslide Road in the north end of Sault Ste. Marie. Hundreds of oak leafshredder moths (Figure 5.3) were seen flying around the stand as well as two gypsy moth (*Lymantria dispar* L.) larvae. Defoliation in the stand was most likely caused by oak leafshredder with the presence of so many adult oak leafshredder moths. Although defoliation was light in 2009, with the number of adult moths flying around it could potentially cause more damage in 2010.

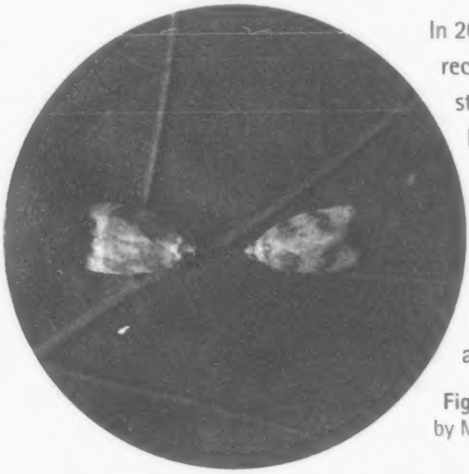


Figure 5.3 Oak leafshredder moths Sault Ste. Marie District (photo by M. Francis).

Eastern larch beetle, *Dendroctonus simplex* (LeC.)

This small bark beetle was recorded north of Moonbeam in Hearst District contributing to mortality of tamarack (*Larix laricina* (Du Roi) K. Koch). A small pocket of tree mortality, approximately 15%, was observed in a stand of tamarack and black spruce on Hwy. 581 north of Moonbeam.

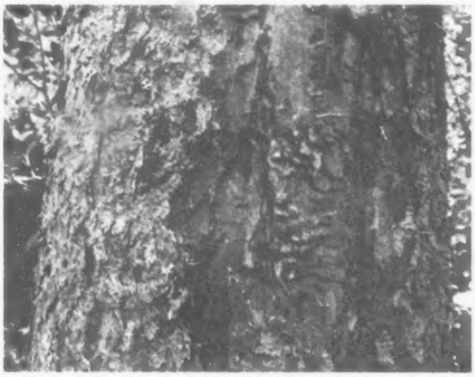


Figure 5.4 Eastern larch beetle galleries on tamarack (photo by T. Straight).

The eastern larch beetle feeds exclusively on tamarack, and may have up to three generations in one year. This opportunistic beetle is known to invade stressed or dying trees or those that have died recently. Larvae create galleries under the bark in the vascular tissue. In large numbers, these galleries disrupt the phloem and restrict or prevent the transport of nutrients within the tree (Figure 5.4).

Greenstriped mapleworm, *Dryocampa rubicunda alba* Grt.

This defoliator has historically caused moderate-to-severe defoliation in Sault Ste. Marie District on maple (*Acer* spp.). In 2009 a small population was found on several understory young red maple (*Acer rubrum* L.) trees west of Basswood Lake in Kirkwood Township. Overall, defoliation was moderate but several branches were stripped of foilage.

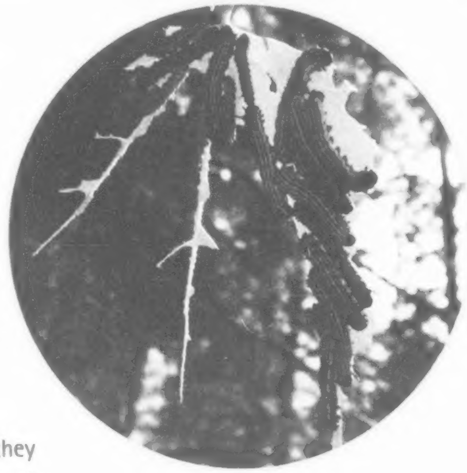
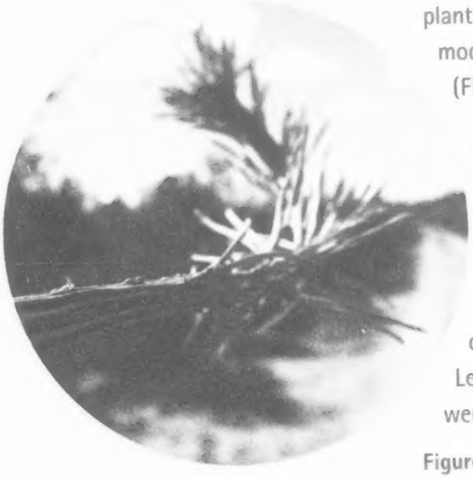


Figure 5.5 Greenstriped mapleworm larvae Kirkwood Township, Sault Ste. Marie District (photo by M. Francis).

Initially larvae feed in groups (Figure 5.5). As larvae mature they scatter and become solitary feeders. Once feeding is complete the larvae drop to the ground where they pupate and overwinter. The following June and early July, the adult moths emerge, mate and the female lays her eggs on the underside of the leaves.

Eastern pine shoot borer, *Eucosma gloriola* Heinr.

Broken and hanging jack pine branches that had been bored by the eastern pine shoot beetle were found in jack pine plantations throughout the North Bay, Chapleau and Wawa districts, Northeast Region in 2009.



Evidence of the eastern pine shoot borer was found in a jack pine plantation off Sucker Lake Road, North Bay District where moderate levels of lateral shoot damage was observed (Figure 5.6).

In Chapleau District, damage by this shoot borer was recorded in a young jack pine plantation in Neelands Township where 5 – 10% of the leaders were damaged.

In Wawa District, a lower level of damage was observed in a jack pine plantation in Davies Township. Less than five percent of the two-to-five metre trees were damaged.

Figure 5.6 Lateral jack pine shoot bored out by the eastern pine shoot borer (photo by J. Jamieson).

Poplar twig gall fly, *Hexomyza shineri* (Giraud)

This gall forming fly was noted in Hearst, Cochrane and Timmins districts on new suckers of live trembling aspen (*Populus tremuloides* (Michx.)). It was also found near Lac Point Lake in Kettle Lakes Provincial Park. The host height ranged between 1 and 3 metres.

Even though the gall can cause permanent disfigurement of the tree, they do not threaten the overall health of the host (Figure 5.7). Permanent scarring or girdling will occur where a bird extracts the insect from its gall.

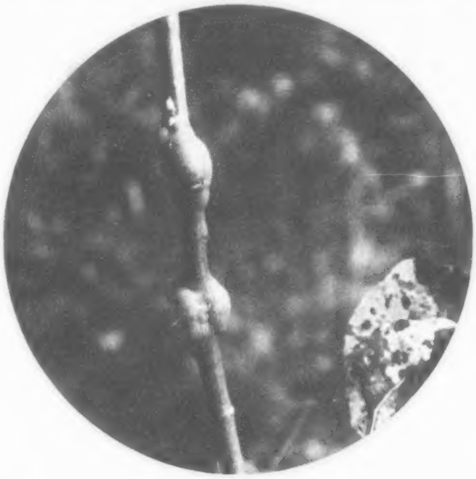


Figure 5.7 Poplar twig gall on trembling aspen in Kettle Lakes Provincial Park (photo by A. Zeppa).

Fall webworm, *Hyphantria cunea* (Drury)

Fall webworm (*Hyphantria cunea* (Drury)) is native to North America and has a Canada-wide distribution.

In 2009, fall webworm was observed in scattered locations across five districts (Cochrane, Chapleau, Hearst, Sudbury and Timmins) in Northeast Region. Low levels of activity such as defoliation and the presence of tents were reported for this native pest on ash (*Fraxinus* spp.), cherry (*Prunus* spp.) and white birch (*Betula papyrifera* Marsh.) under 10 metres in height (Figure 5.8).

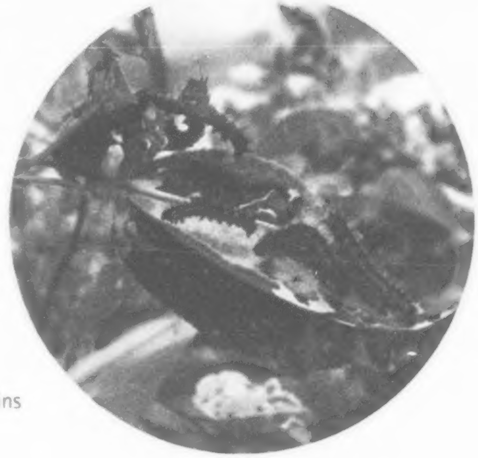


Figure 5.8 Fall webworm on choke cherry in Timmins District in 2009 (photo by A. Zeppa).

Willow flea weevil, *Isochnus rufipes* (LeC.)

Although this small black beetle with reddish legs feeds primarily on willow (*Salix* spp.), it will feed on other hardwoods. The willow flea weevil affected trees in Sudbury, Timmins, Hearst and Cochrane districts in Northeast Region in 2009.

In Sudbury District, it was recorded on golden weeping willow (*Salix alba* L. var. *vitellina* (Stokes)), Bebb willow (*S. bebbiana* (Sarg.)) and balsam poplar (*Populus balsamifera* (L.)). In Hearst, Cochrane and Timmins districts it was detected on shining willow (*S. lucida* Muhl. ssp. *lucida*). The host sustained damage by both the adults, which feed on the leaves causing tiny holes, and the larvae, which blotch mine the foliage by feeding within the tissues of the leaf. While these infestations were moderate-to-severe, the host sustained an approximate leaf drop of only 15%, although in some instances 100% of the leaves turned completely brown. The high populations left the host with an unsightly appearance as the foliage browned prematurely (Figure 5.9).

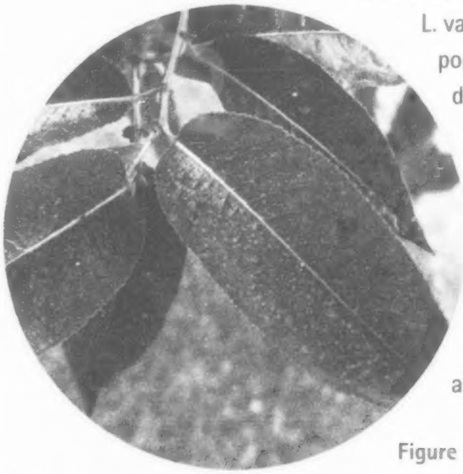


Figure 5.9 Willow flea weevil damage on shining willow (Photo by A. Zeppa).

Eastern tent caterpillar, *Malacosoma americanum* (Fabricius)

The eastern tent caterpillar is commonly seen along roadways creating silken tents in the crotches of several hardwood species, especially cherry (*Prunus* spp.).

In the Northeast Region, eastern tent caterpillar was recorded on roadside choke cherry and pin cherry trees in Sault Ste. Marie and Sudbury districts in 2009.

Eastern tent caterpillar were seen on D Line on St. Joseph's Island, Sault Ste. Marie District. Defoliation was severe wherever the tents were found. Choke cherry was the preferred host.

Eastern tent caterpillar was also found defoliating cherry trees throughout Sudbury District. This was commonly seen along roadways and scattered ornamental shrubs within the city of Greater Sudbury and on Manitoulin Island (Figure 5.10).

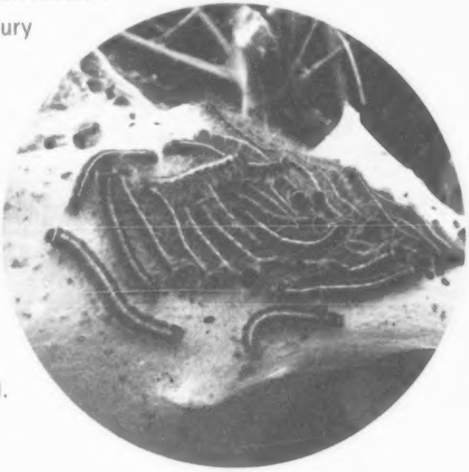


Figure 5.10 Eastern tent caterpillar in tent on pin cherry on Manitoulin Island, Sudbury District (photo by W. Byman).

Swaine jack pine sawfly, *Neodiprion swainei* Midd.

The Swaine jack pine sawfly is native to Canada and has a known range which closely follows that of its host jack pine (*Pinus banksiana* Lamb).

In 2009, this defoliator was detected in Northeast Region near Skead, Sudbury District, causing significant defoliation on jack pine tress in a young plantation (Figure 5.11).

While there was no aerially mapped defoliation of this pest in 2009, it has the ability to cause significant defoliation and mortality in jack pine stands.

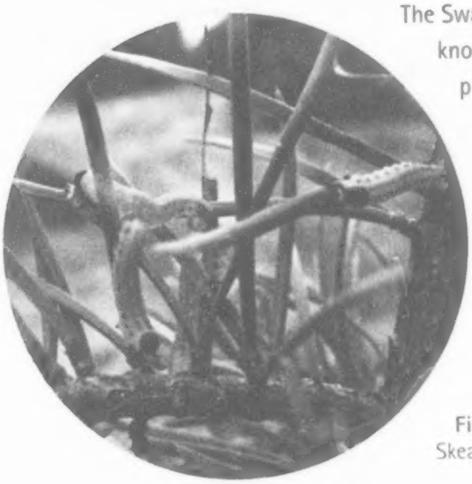


Figure 5.11 Swaine jack pine sawfly defoliating jack pine in Skead, Sudbury District (photo by W. Byman).

Balsam poplar leafblotch miner, *Phyllonorycter nipigon* (Free.)

The balsam poplar leafblotch miner caused moderate-to-severe damage to stands of balsam poplar across Northeast Region in 2009. This damage was commonly seen in North Bay, Kirkland Lake, Cochrane, Timmins and Hearst districts.

In August, larvae were feeding in blisters on the underside of balsam poplar leaves giving balsam poplar stands a bronzy-brown hue (Figure 5.12).

This late season leafblotch miner is often of little consequence, but consecutive years of severe attack may weaken the tree making it vulnerable to other insects and pathogens.

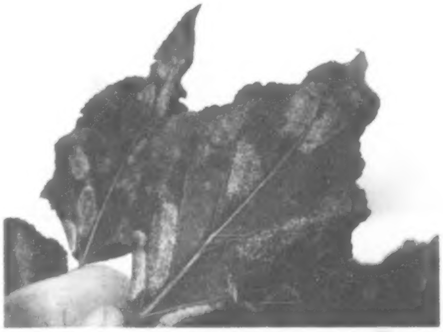


Figure 5.12 Typical damage on balsam poplar caused by the balsam popular leafblotch miner in Kirkland Lake District (photo by J. Jamieson).

Aspen leafblotch miner, *Phyllonorycter ontario* Free.

A close relative to the balsam poplar leafblotch miner, the aspen leafblotch miner is the most common species of leafblotch miner in Ontario. This pest damaged scattered stands of trembling aspen across Northeast Region in 2009.

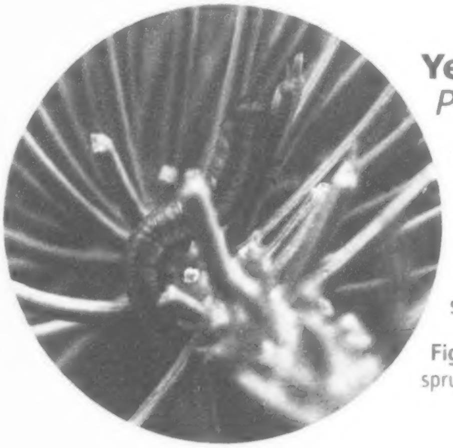
In Sault Ste. Marie District, moderate-to-severe leafblotch miner damage was recorded on understory trembling aspen in Wells Township in 2009.

Lower levels of browning foliage were also observed on understory aspen in McConkey Township near North Monetville and in the communities of Feronia and Balsam Creek just east of the city of North Bay, all in North Bay District.

Low level of damage was also seen in Cochrane District near the community of Strickland (Figure 5.13).

Figure 5.13 Foliar browning caused by aspen leafblotch miner in Cochrane District (photo by A. Zeppa).

Pale oval mines from the leaf miner were also found on leaves of aspen in Kirkland Lake District along Hwy. 11 and Hwy. 112.



Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.)

This pest was found in several locations across Northeast Region on roadside and ornamental spruce (*Picea* spp.) trees, causing significant defoliation on white (*P. glauca* (Moench) Voss), black (*P. mariana* (Mill.)), and Colorado spruce (*P. pungens* Engelm.) (Figure 5.14).

Figure 5.14 Yellowheaded spruce sawfly larva on Colorado spruce in Sudbury district (Photo by W. Byman).

Defoliation was common in North Bay and Kirkland Lake districts, the communities of Timmins, Hearst and Sudbury, and along Hwy. 101 southwest of Foleyet in Ivanhoe Township.

Hosts varied in height from 1 to 2.5 m and had moderate-to-severe defoliation. In some instances defoliation exceeded 50%.

Ragged spruce gall adelgid, *Pineus similis* (Gill.)

The presence of ragged spruce gall adelgid on white and red (*Picea rubens* Sarg.) spruce trees in North Bay and Timmins districts was evident by the drooping, grey needles at branch tips.

A mature red spruce stand in Blyth Township, North Bay District suffered damage to approximately 30% of the tips on the host trees. The characteristic pineapple shaped galls were quite small at the time of observation and the soft-bodied, sucking insects had already emerged (Figure 5.15).

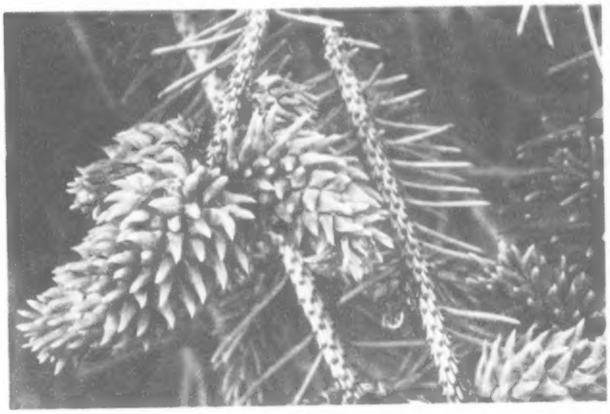


Figure 5.15 Pineapple-shaped galls formed by ragged spruce gall adelgids in Cochrane District (photo by A. Zeppa).

A small infestation of the adelgid causing moderate damage was discovered on a group of ornamental white spruce trees in the city of Timmins.

Although the adelgid rarely causes severe damage, the urban ornamental spruce were also severely defoliated by yellow headed spruce sawfly adding to the stress on the trees.

White pine weevil, *Pissodes strobi* (Peck)

Populations of white pine weevil were recorded in Northeast Region during the field season of 2009. Typical symptoms included withered main leaders with puncture wounds from the adult weevil.

Trace levels of damage were noted along the east side of Hwy. 64 adjacent to Red Cedar Lake in McLaren Township in North Bay District.

Similar damage was also noted within Kirkland Lake District along Hwy. 650 in Boston Township where eastern white pine (*Pinus strobus* L.) trees 2 m tall had trace levels of damage.

White pine weevil damage was also reported southwest of the town of Chapleau in Triquet Township. Surveys of a jack pine plantation revealed overall leader damage to be less than

5%. Damage to open growing ornamental white and Colorado spruce was also observed within the town of Chapleau.

Balsam shootboring sawfly, *Pleroneura brunneicornis* Roh. (=*borealis* Felt)

The damage caused by the balsam shootboring sawfly to understory semi-mature balsam fir (*Abies balsamea* (L.)) in a mature red spruce stand in the northeast corner of Blythe Township, North Bay District was similar in appearance to frost damage. The concealed feeders bored into new balsam fir shoots sometime between May and July and the feeding resulted in reddish-brown, wilted tips. Although damage in this stand often affected over 40% of the shoot tips, the trees are expected to recover and the impact on tree health or growth is likely to be minimal.

Pitch mass borer, *Synanthedon pini* (Kell.)

In Sault Ste. Marie District, several pitch masses were recorded in a semi-mature white spruce plantation in Wells Township on Melwell Road. Upon peeling back the pitch, mass larvae were found just under the bark (Figure 5.16). These pitch masses were found on <1% of the trees.

Pitch mass borer larvae feed on the inner bark and sapwood for two or three years. While this feeding will not kill the host, it can cause defects in lumber. These pitch masses can also be found on pine trees.

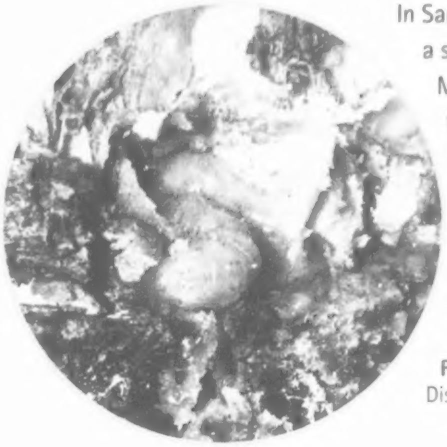


Figure 5.16 Pitch mass borer larva on white spruce Sault Ste. Marie District (photo by M. Francis).

FOREST DISEASES

Spruce Needle Rust, *Chrysomyxa* sp.

The damp, cool summer of 2009 provided optimum conditions for foliar diseases such as spruce needle rust to flourish in Northeast Region. In mid-August, white and black spruce growing in close proximity to the most common alternate host, Labrador tea (*Rhododendron groenlandicum* (Oeder) Kron & Judd), began to exhibit the symptomatic yellow discoloration produced by spores maturing on the surface of the needle (Figure 5.17). Infected needles on the spruce will dry out and eventually fall off the host tree, but it is unusual for spruce needle rust to cause mortality to its host.

Fungal spores give the foliage a yellow hue that was seen throughout the districts of Wawa, Chapleau, Sudbury, Timmins, Cochrane, Sault Ste. Marie and Hearst.

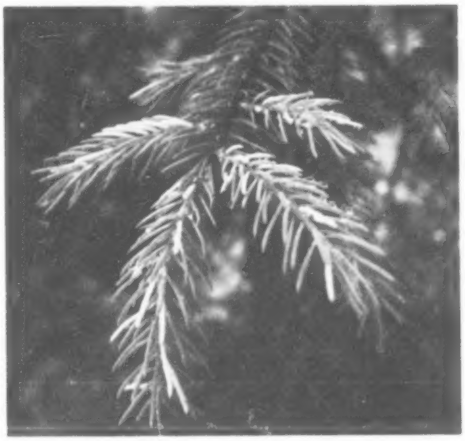


Figure 5.17 Spruce needle rust on black spruce in Timmins District (Photo by A. Zeppa).

One of the most severe areas of infection occurred in Wawa District along an area commonly referred to as the Tremblay Flats located within Michipicoten First Nation. Some white spruce trees, 6-10 m tall, had 75-100% foliar damage.

In Chapleau District, this needle rust was common along the Sultan Industrial Road in Carew Township as well as the west end of Hwy. 560. Understory black spruce had 60-75% foliar damage.

Spruce needle rust was also noted throughout Sudbury, Timmins and Cochrane districts. It was also recorded on young understory black spruce trees on the west side of Villeneuve Township, Sault Ste. Marie District.

In Hearst District, it was confirmed in a spruce plantation north on Bannerman Road.

Pine needle rust, *Coleosporium asterum* (Diet.) Syd. & P.Syd.

This disease does well when there is moist weather conditions such as was experienced in 2009.

During a plantation survey in early June, evidence of pine needle rust was found in McCarthy Township, Sudbury District. It occurred on 98% of the 150 jack pine surveyed with 17.2% of the needles affected on the trees.

Linospora leaf blight, *Linospora tetraspora* G.E. Thomps.

Infection by this fungus shows up as dark brown blotches on the leaves, which occasionally inundate the entire leaf. This infection generally causes the leaves to fall off prematurely.

Linospora leaf blight was common on balsam poplar throughout Hearst, Cochrane and Timmmins districts in 2009. The linospora blight gave the balsam poplar an overall unhealthy brown appearance. This was also compounded by an insect, the poplar leaf blotchminer, which also affected the foliage. More than 80% of foliage was infected by this fungus on trees where the disease was active.

This disease was first noticed in late August when infected balsam poplar trees across the Chapleau District began to take on a premature fall like appearance. Along Hwy. 129 in Reany Township, 5-10 metre balsam poplar trees were 80-95% infected by this leaf blight. By mid-September most trees that exhibited symptoms had already dropped their leaves for the season.

Pine Needle Cast, *Lophodermella concolor* (Dearn.) Darker

Pine needle cast is a native needle cast fungus that attacks jack pine and Scots pine in Ontario. While it attacks only second year needles, this fungus can reduce vigor and induce mortality in young pine stands.

Pine needle cast was found in young jack pine plantations both in McCarthy and Leinster townships within Sudbury District (Figure 5.18). Damage to individual trees was high while the occurrence was scattered throughout the affected stands.

Lophodermium Needle Cast, *Lophodermium seditiosum* Minter, Staley, and Miller

Lophodermium needle cast is a fungus that occurs in late summer infecting current year's needles causing lesions that are yellow in colour in late fall and early spring. Infected needles later turn brown and die by the following summer (Figure 5.19).

Severe infection by this needle cast on semi-mature to mature pine trees, including Austrian pine (*Pinus nigra* Arnold), jack pine, red pine, and Scots pine (*P. sylvestris* L.), may cause loss of growth, but heavy needle cast on young seedlings and saplings may cause whole tree mortality.

In 2009, a total of 196 ha of moderate-to-severe lophodermium needle cast was aerially mapped in two semi-mature red pine plantations in McGillvray Township northwest of Trout Creek in North Bay District (Figure 5.20).

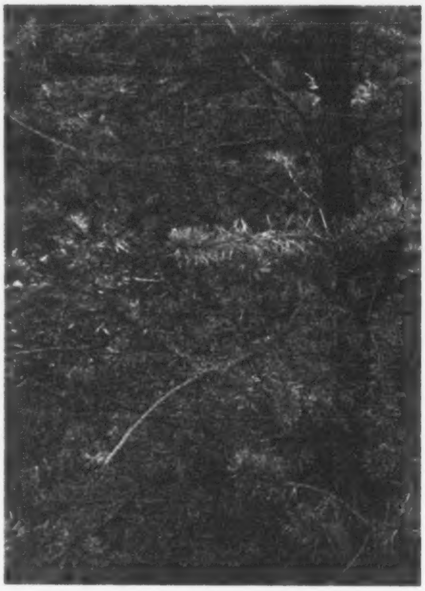


Figure 5.18 Pine needle cast on second year needles of jack pine in McCarthy Township, Sudbury District (photo by W. Byman).

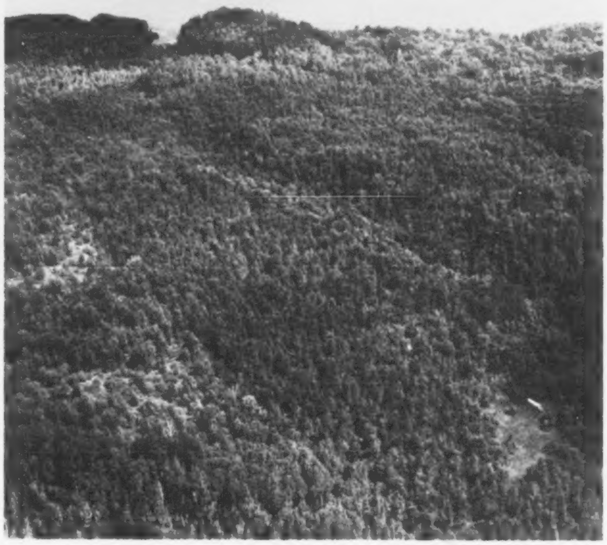


Figure 5.19 Lophodermium needle cast (needle browning) in a red pine plantation northwest of Trout Creek, North Bay District (photo by J. Jamieson).

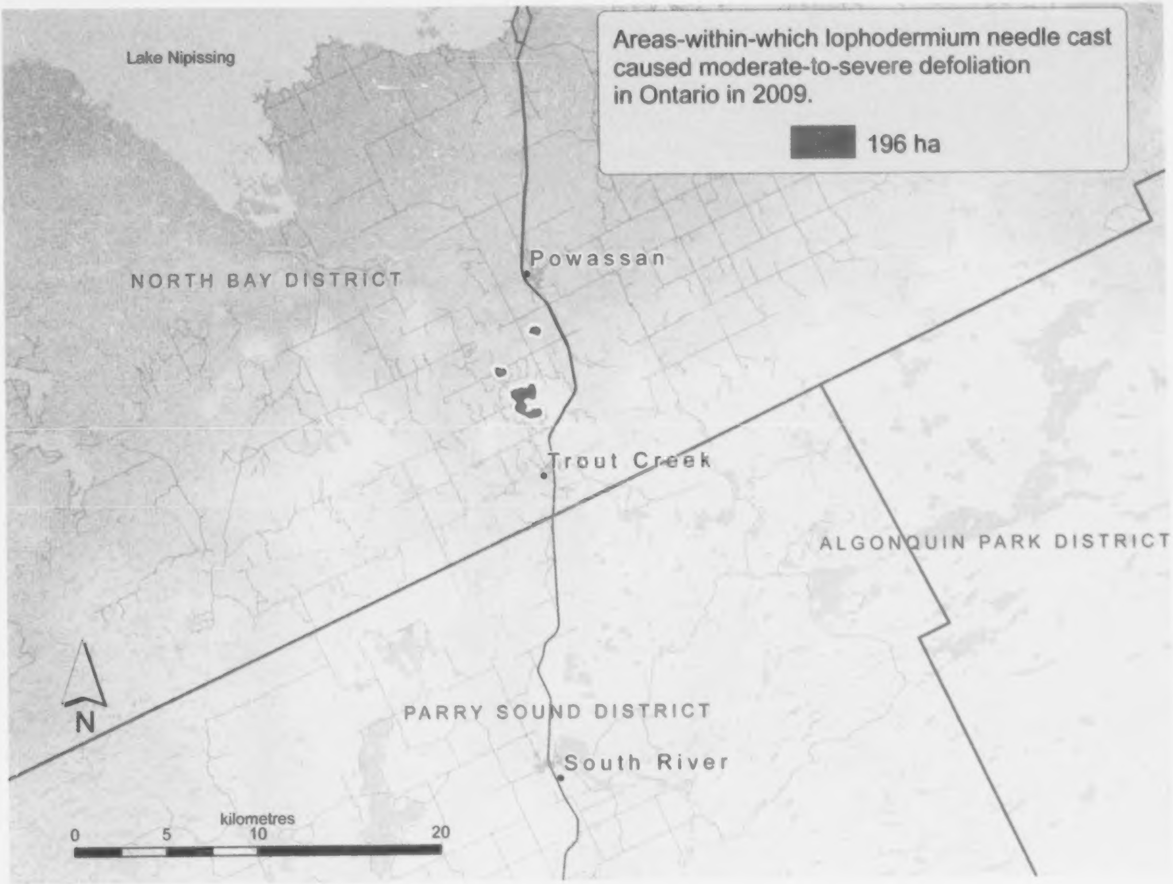

Areas-within-which lophodermium needle cast caused moderate-to-severe defoliation in Ontario in 2009.
196 ha
Lake Nipissing
NORTH BAY DISTRICT
Powassan
Trout Creek
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
South River
N
kilometres
0
5
10
20

Figure 5.20 Areas-within-which lophodermium needle cast caused moderate-to-severe damage in Ontario in 2009.

Needle rust of balsam fir, *Pucciniastrum epilobii* G. H. Otth.

Needle rust of balsam fir is caused by a fungus that requires two host plants to complete its lifecycle. The tree host is balsam fir and the alternate host is fireweed (*Epilobium* sp.). The cool, wet weather in August in Northeast Region contributed to the common occurrence of this disease.

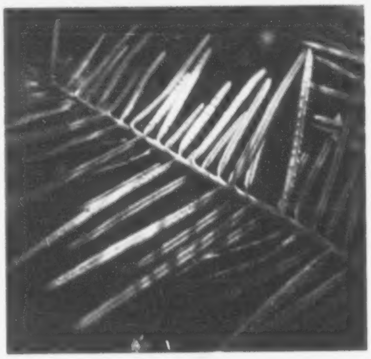


Figure 5.21 Fruiting bodies of needle rust of balsam fir on understory balsam fir in Haentschell Township, Sudbury District (photo by W. Byman).

During routine surveys, chlorotic looking needles were found on understory balsam fir in Shields Township northwest of Searchmont, Sault Ste. Marie District. Moderate levels of the fruiting bodies were found on the underside of the needles, on branches closest to the ground.

In Sudbury District, needle rust of balsam fir was also found in Haentschell Township on understory balsam fir saplings (Figure 5.21).

Diplodia tip blight, *Sphaeropsis sapinea* (Fr.) Dyko & B. Sutton

Diplodia tip blight is caused by a fungus that usually affects trees that are 25 years or older. However, the blight was recorded in 2009 on young pine species in plantations in Sudbury, North Bay and Kirkland Lake districts of Northeast Region.

In Sudbury District, three jack pine plantations in the Espanola area were infected with diplodia tip blight causing light-to-moderate defoliation. The tips of branches were killed causing the needles to desiccate on the branch leaving bright red needles on the tips of green branches.

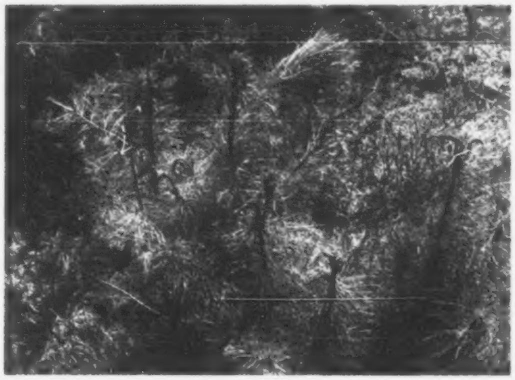


Figure 2.22 Buds and needles of a red pine sapling in a jack pine plantation in North Bay District killed by diplodia tip blight (photo by J. Jamieson).

Diplodia tip blight was also observed in a jack pine plantation just off Sucker Lake Road in North Bay District; however, it was young red pine growing among the jack pine that had a high incidence rate of severe damage to the leaders and branch tips (Figure 5.22).

In Kirkland Lake District, moderate damage by diplodia tip blight was also found on the lateral branch tips of a few individual jack pine trees in Coleman Township.

FOREST ABIOTIC EVENTS

Frost Damage

In Sault Ste. Marie District, cooler than normal temperatures in May resulted in frost damage on semi-mature aspen in low-lying areas on the south end of Ranger Lake Road. This damage appeared to be defoliation at first, but after cutting down a few branches it was discovered that the emerging leaves were brown in colour and shriveled. These aspen trees re-flushed in July with smaller leaves that were lighter green.

Oak Mortality

In Northeast Region, several areas of oak decline and mortality were mapped throughout Sudbury District totaling 3,567 ha in 2009 (Figure 5.23).

These dead and dying trees were in the central part of the district. A large pocket was located south of Lake Wanapitei in the vicinity of Sudbury airport (Figure 5.24).

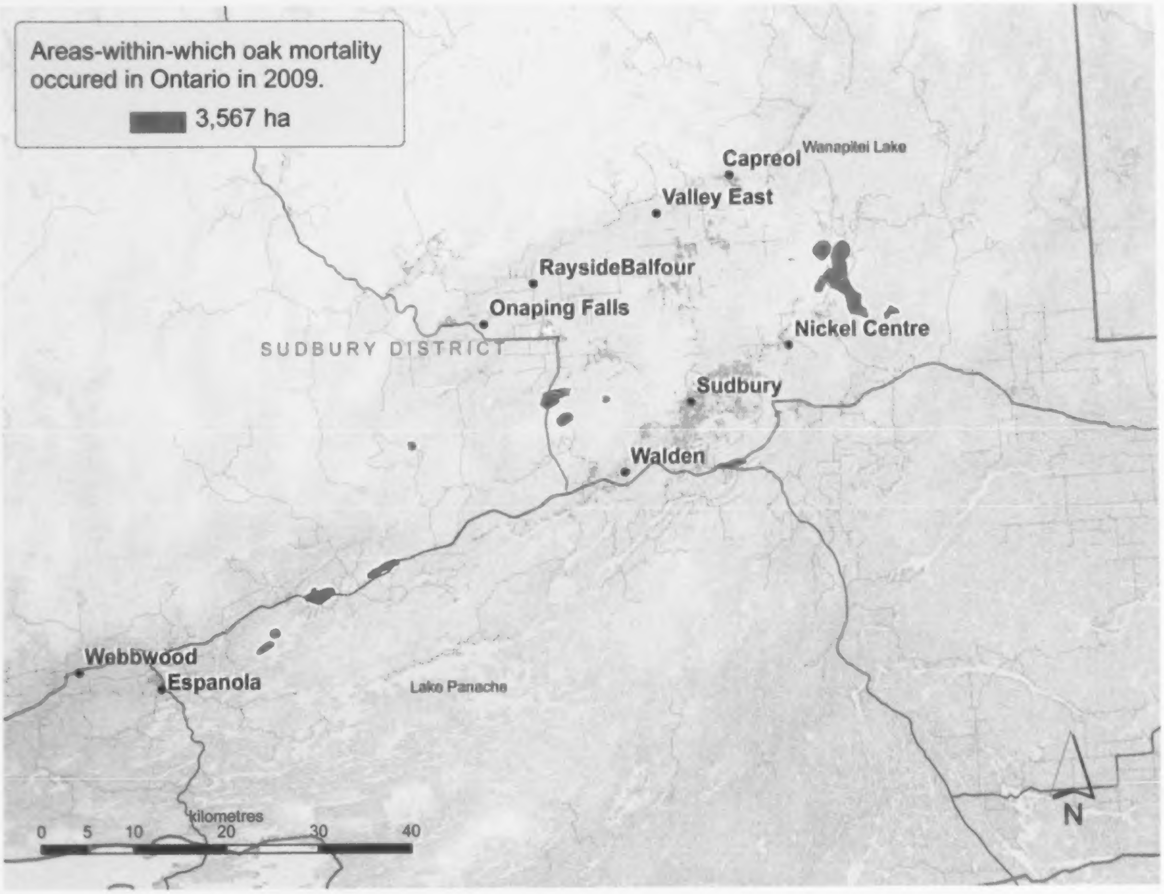

Areas-within-which oak mortality occured in Ontario in 2009.
3,567 ha
Capreol
Wanapitei Lake
Valley East
RaysideBalfour
Onaping Falls
SUDBURY DISTRICT
Nickel Centre
Sudbury
Walden
Webbwood
Espanola
Lake Panache
kilometres
0 5 10 20 30 40
N

Figure 5.23 Areas-within-which oak mortality occurred in Northeast Region in 2009.

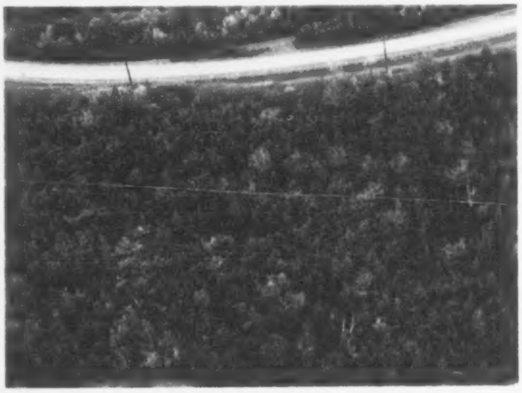
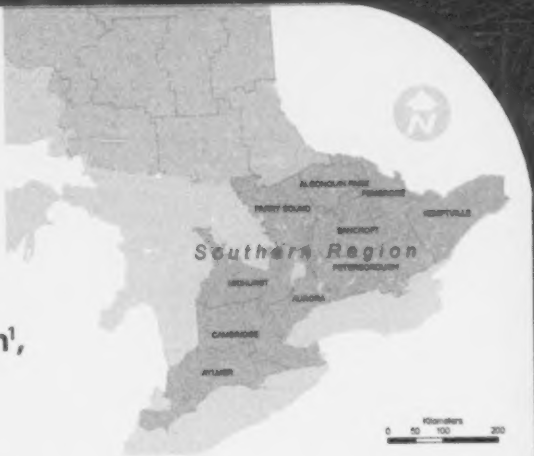


Figure 5.24 Aerial view of oak mortality near Skead, Sudbury District (photo by W. Byman).

Several other smaller pockets were located between Sudbury and Espanola along Hwy. 17 as well as west of Sudbury on the southwest side of Whitewater Lake, south of Sudbury near the junction of Hwy. 69 and the southeast bypass of Hwy. 17.

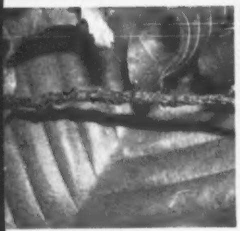
The affected red oak trees were located along rocky ridge tops in well drained sites. Oak mortality is likely the result of a severe drought in 2001, in combination with moderate-to-severe defoliation over the last 10 years by gypsy moth and forest tent caterpillar.

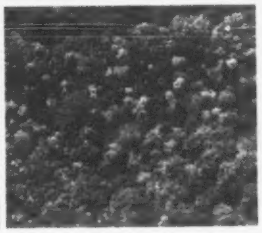
Southern Region

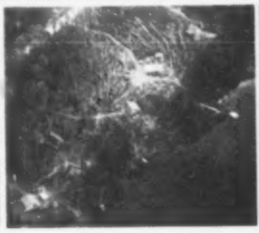


E. Cleland[1], P. Hodge[1], S. McGowan[1], and E. Czerwinski[1]

[1] Ontario Ministry of Natural Resources, Forest Management Branch, Forest Health & Silviculture Section, Sault Ste. Marie







FOREST INSECTS

Fall cankerworm, *Alsophila pometaria* (Harr.)

Fall cankerworm is a native insect that has the ability to reach outbreak populations in Ontario. Often this insect is active in urban environments causing defoliation on a number of host trees such as basswood (*Tilia americana* L), Manitoba maple (*Acer negundo* L.), oak (*Quercus* spp.), ash (*Fraxinus* spp.), other maples (*Acer* spp.) and fruit trees. In late November, eggs are laid on fine twigs by wingless female moths. Hatch occurs at bud break the following spring allowing young larvae to feed on buds and expanding leaves (Figure 6.1). Feeding is generally gregarious and is usually completed by late-June, at which time larvae drop to the soil and pupate. Adult moths mate and flightless females crawl up the tree to lay eggs.

Populations of this potentially damaging pest collapsed in 2009 in Aurora District, where high populations had been causing moderate-to-severe defoliation since 2007. While only trace levels were recorded in Aurora District, new populations of this insect were detected causing severe defoliation in Aylmer and Guelph districts in 2009 (Figure 6.2).

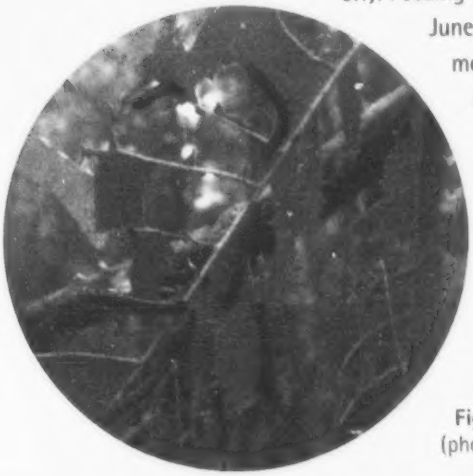


Figure 6.1 Larvae of fall cankerworm feeding on white ash (photo by E. Cleland).

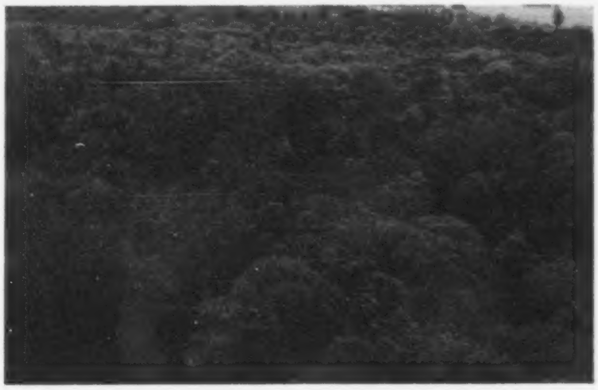


Figure 6.2 Moderate-to-severe defoliation by fall cankerworm in Fisher Conservation Area (photo by E. Cleland).

Moderate-to-severe defoliation totalled 426 ha, which occurred in Charlotteville Township at Fisher Conservation Area and in the South Walsingham Forest, South Walsingham Township, both in Norfolk County, Aylmer District (Figure 6.3). An additional 119 ha of light defoliation was also recorded in this same area.

In both infestations, favoured hosts were red oak (*Quercus rubra* L.), white oak (*Q. alba* L.), white ash (*Fraxinus americana* L.) and red maple (*Acer rubrum* L.), although a wide range of other hardwood tree and shrub species were also defoliated.

In Guelph District, a collection of this defoliator was also made on basswood at Royal Botanical Gardens, near Burlington.

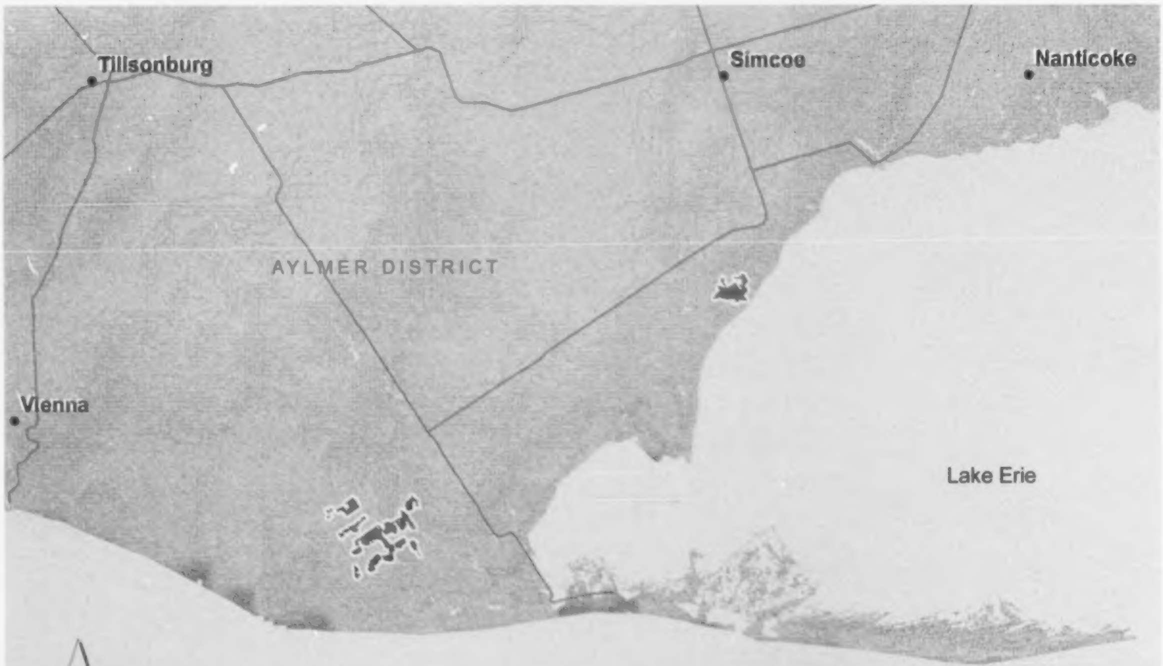

Tillsonburg
Simcoe
Nanticoke
AYLMER DISTRICT
Vienna
Lake Erie
N
kilometres
0
5
10
20
Areas-within-which fall cankerworm caused defoliation in Ontario in 2009.
light - 119 ha
moderate - severe - 426 ha

Figure 6.3 Fall Cankerworm infestation in Ontario in 2009.

Aurora District had trace levels of defoliation on basswood, white ash and understory dogwoods (*Cornus* spp.) throughout historically-infested sites. Elm spanworm (*Ennomos subsignaria* (Hbn.)) and spiny looper (*Phigalea titea* (Cram.)) were also reported feeding alongside fall cankerworm in satellite pockets from Kelso Conservation Area north to Guelph Line and Steeles Avenue, Halton Regional Municipality.

Pine spittlebug, *Aphrophora cribrata* (Wlk.)

Damage from this typically inconsequential insect was recorded near Westport, Kemptville District on Scots pine (*Pinus sylvestris* L.). Further south, additional high numbers of this insect were noted in Turkey Point Provincial Park and the Long Point Waterfowl and Wetlands Research and Education Centre, both near Turkey Point, Aylmer District.

Cedar leafminer, *Argyresthia* spp.

Several species of leaf miners are often found feeding together on eastern white cedar (*Thuja occidentalis* L.). The most common are arborvitae leafminer, *Argyresthia thuiella* (Pack.), and cedar leafminer, A. aureoargentella Brower. Historically, these pests have been active across Southern Region, causing browning on individual branches initially; which has resulted in whole-tree mortality during extended infestations (Figure 6.4).

Figure 6.4 Mined leaves of eastern white cedar (photo by S. McGowan).

Light foliar damage was observed at Sharpe's Creek Rd. near Clinton, Huron County, Guelph District. In eastern Ontario, moderate foliar damage occurred throughout much of Leeds and Grenville County, Kemptville District and near Cobden, Renfrew County in Pembroke District.

Further moderate damage occurred along the Holland-Sydenham townline in Grey County, with several similar pockets of damage observed between this location and Owen Sound, both in Midhurst District.

Basswood leafminer, *Baliosus nervosus* (Panz.)

Damage caused by basswood leafminer was reported throughout Midhurst and Aurora districts and in one location in Guelph District in 2009. In comparison to previous years, damage in both Aurora and Midhurst districts decreased. Light infestation levels were noted at one location in Simcoe County on 15% of understory basswood, and in a mixedwood stand in Tiny Township, Midhurst District, where damage was recorded primarily in the upper crown of the same host. Damage to foliage was also noted at light levels in many scattered locations throughout the Town of Caledon, Regional Municipality of York, Aurora District.

In Guelph District, further damage on the majority of basswoods growing in a 5 ha deciduous stand was recorded at severe levels, south of Bayfield, on Sugarbush Road, Huron County,

Oak skeletonizer, *Bucculatrix ainsliella* Murt.

This insect is often found as a larva on its preferred host, red oak. Larvae are often seen spinning down off the tree on silken threads or on leaves in the pupal stage. Two generations occur per year so leaf skeletonization may occur from late April to mid-October.

In July, near Forks of the Credit Provincial Park within Peel Regional Municipality, Aurora District, a red oak stand was defoliated at light levels. Additional trace level observations were also noted at Short Hills Provincial Park, Niagara Regional Municipality, Guelph District.

Horned oak gall wasp, *Callirhytis cornigera* (O.S.)

Galls created by horned oak gall wasps were noted in several oak stands across Guelph District in 2009. The first generation of wasp occurs within the leaves of favoured hosts creating small, oblong galls. A second generation emerges from these galls in July, when adults mate and lay eggs on nearby twigs. These eggs overwinter and hatch the following spring. The larvae mature causing a second set of galls. Maturation can take up to two years before the second generation emerges.

Collections of this insect were made near Allenport, Niagara Regional Municipality on pin oak (*Q. palustris* Muenchh.) where damage from this wasp was affecting 25% of the host trees on site.

Orange spruce needleminer, *Coleotechnites piceaella* (Kft.)

This common insect of ornamental spruce (*Picea* spp.) was discovered mining needles in all districts across Southern Region. In Peterborough and Midhurst districts, larvae were detected feeding alongside spruce budworm (*Choristoneura fumiferana* (Clem.)) and contributing to moderate levels of defoliation in North Monaghan Twp., Peterborough District and along Hwy. 10 near Chatsworth, Grey County, Midhurst District.

Collections were also made on Norway spruce (*P. abies* (L.) Karst.) where orange spruce needleminer was part of a complex of insects contributing to severe crown decline at Hagersville Cemetery, Haldimand County, Aylmer District. Additionally, roadside white spruce (*P. glauca* (Moench)) along Fruit Ridge Line, Elgin County, Aylmer District and in Ramseyville, Kemptville District held small populations causing light levels of defoliation.

Red turpentine beetle, *Dendroctonus valens* LeC. and **pine engraver**, *Ips pini* (Say)

These two bark beetles are considered secondary pests of pine (*Pinus* spp.), spruce and occasionally other conifers. Trees that are experiencing stress from other pests or abiotic factors offer beetles ideal conditions for brood sites. Adults construct galleries beneath the bark and lay eggs which hatch soon after. The larvae immediately begin feeding on the inner bark. The combination of adult and larval feeding disrupts the translocation of water and nutrients within the host and contributes to further decline or mortality.

Dense populations of these common insects were noted causing significant damage and mortality to a stressed Scots pine plantation at St. Williams Conservation Reserve, Norfolk County, Aylmer District.

Lined black aspen caterpillar, *Egira dolosa* (Grt.)

Larvae of this lepidopteran species were collected feeding in the understory of a severely defoliated mixedwood stand in conjunction with fall cankerworm and gypsy moth (*Lymantria dispar* (L.)) in Aylmer District in late June. While fall cankerworm was the primary defoliator in this instance, the lined black aspen caterpillar was recorded feeding on the same hosts and contributed to the overall defoliation.

Cherry scallopshell moth, *Hydria prunivorata* (Fgn.)

For the second consecutive year, landscape level defoliation by cherry scallopshell moth was recorded on black cherry (*Prunus serotina* Ehrh.) in Southern Region. Collections were made in Aylmer, Midhurst and Kemptville districts. The last record of moderate-to-severe defoliation prior to 2008 dates back to 1972.

Eggs are laid on the underside of leaves, larvae soon hatch and feed gregariously before dropping to the forest floor to pupate and overwinter (Figure 6.5).

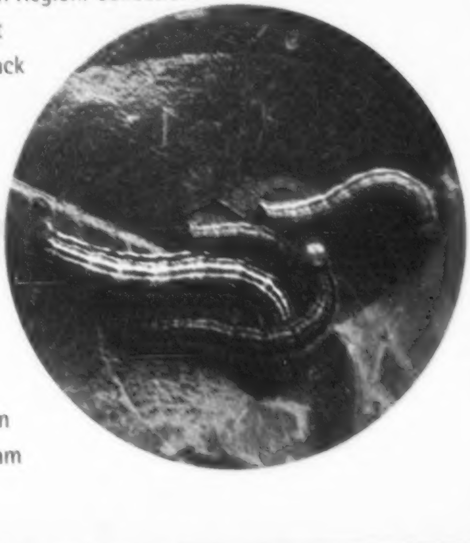


Figure 6.5 Mature cherry scallopshell moth larva feeding on black cherry (*P. serotina* Ehrh.) (photo by E. Cleland).

In Aylmer District, 146 ha of moderate-to-severe defoliation was recorded in 2009. This compares to 224 ha recorded in 2008. There was only one instance where defoliation recurred in the same wooded area from the previous year, in Vienna, Bayham

Twp, Elgin County. All other major infestations were in Norfolk County where severe damage occurred along North Road in the former township of Houghton (Figure 6.6).

Light defoliation was also recorded in the town of Angus, Simcoe County, Midhurst District and on a single tree near Purcell Rd., Constance Bay in Kemptville District.

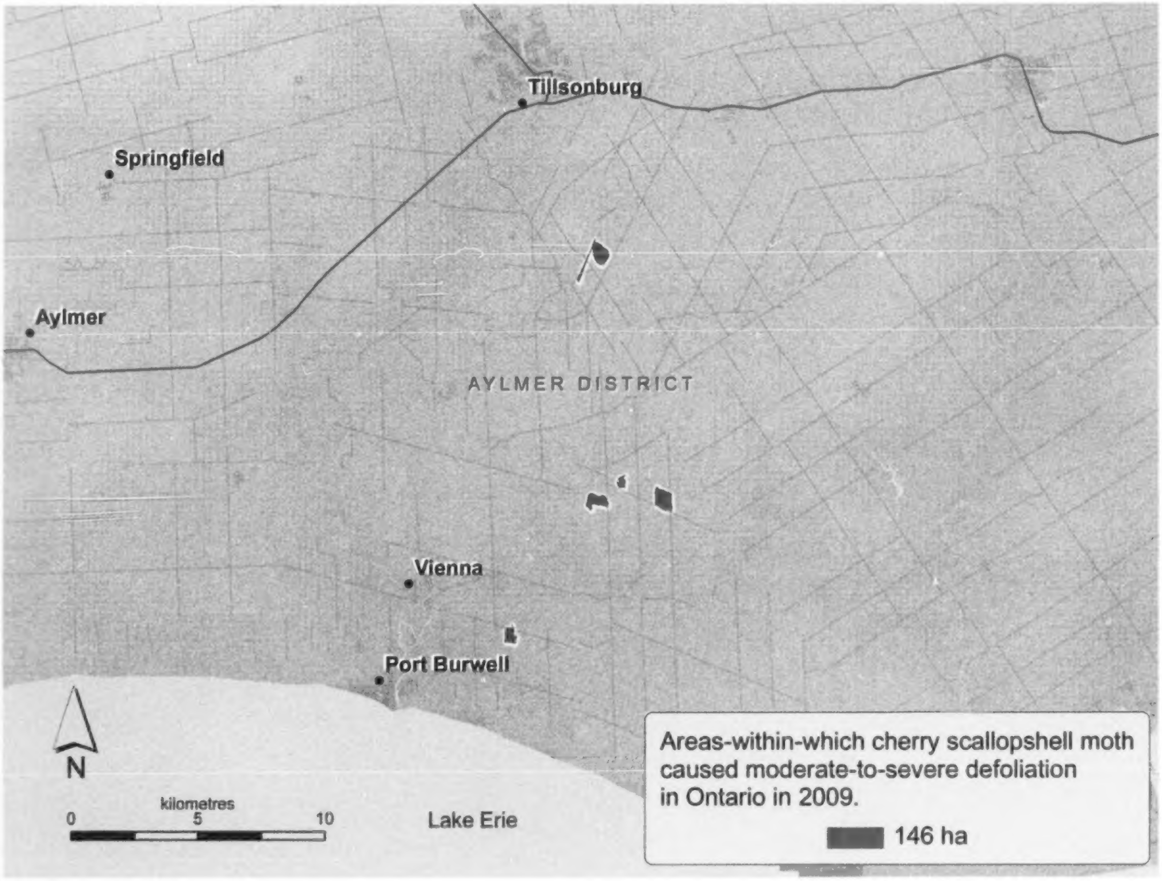

Tillsonburg
Springfield
Aylmer
AYLMER DISTRICT
Vienna
Port Burwell
N
kilometres
0
5
10
Lake Erie
Areas-within-which cherry scallopshell moth caused moderate-to-severe defoliation in Ontario in 2009.
▨ 146 ha

Figure 6.6 Areas-within-which cherry scallopshell moth caused moderate-to-severe defoliation in Ontario, 2009

Eastern ash bark beetle, *Hylesinus aculeatus* Say and **northern ash bark beetle,** *H. criddlei* Swaine

Eastern ash bark beetle is known to accelerate the death of ash (*Fraxinus* spp.) trees weakened by other factors including ice damage, drought, water table fluctuation and infestation by other pests.

Adults construct a gallery and deposit eggs beneath the bark of susceptible host trees. Hatched larvae tunnel perpendicular to the egg galleries during maturation feeding, and burrow straight out from their pupal cells as young adult beetles, creating small, round exit holes (Figure 6.7).

In fall, adults construct short feeding tunnels in the bark of living or recently fallen trees to overwinter.

High populations of eastern ash bark beetle were found at Curry Hill, Stormont, Dundas and Glengarry County, in Kemptville District . This bark beetle was also noted contributing to the landscape-level general decline of ash trees which occurred in Aylmer and Guelph districts in 2009.

In addition, the related northern ash bark beetle was recorded in high numbers causing mortality to approximately 50 mature red ash (*F. pennsylvanica* Marsh) just east of the town of Brooklyn, Durham Regional Municipality, Aurora District.

Fall webworm, *Hyphantria cunea* (Drury)

In 2009, fall webworm was recorded on ash, black walnut (*Juglans nigra* L.), shagbark hickory (*Cayra ovata* (Mill.) K. Koch.), bitternut hickory (*C. cordiformis* (Wangenh.)), black cherry and red oak, basswood, American beech (*Fagus grandifolia* Ehrh.), sugar maple (*A. saccharum* Marsh.) and Manitoba maple (Figure 6.8).

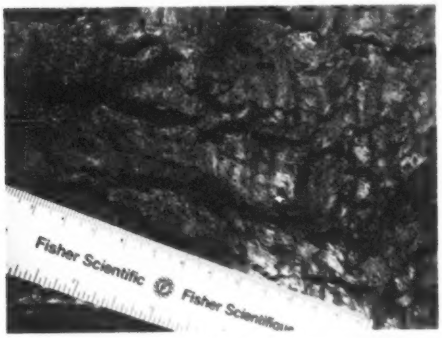


Figure 6.7 Holes made by the eastern ash bark beetle (photo by S. McGowan).

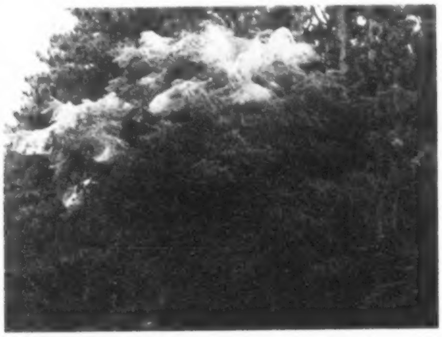


Figure 6.8 Fall webworm nests in black walnut tree (photo by E. Cleland).

In Aylmer District, 510 ha of moderate-to-severe defoliation was aerially mapped within the St. Williams Conservation Reserve, Norfolk County. Compared to previous years, this defoliation is a record high for the county and continues an upward trend of moderate-to-severe defoliation dating back to 2006.

Colonies of fall webworm continue to affect basswood, American beech, sugar maple and Manitoba maple along the Niagara Escarpment near Campbellville and north to Georgetown, Halton Regional Municipality, Aurora District. These locations suffered light levels of defoliation in 2008 and again in 2009. In Kemptville District, an infestation recurred north of South Gower, Leeds and Grenville County. Here, ash and basswood were enshrouded with nests over two metres in diameter.

Southern pine engraver, *Ips grandicollis* (Eich.)

This secondary pest of pines is often found in its nuptial chamber, just under the bark where it produces mass numbers of offspring which often cause whole-tree mortality. In 2009, high populations were discovered causing major decline and in some cases mortality in a mature red pine (*P. resinosa* Ait.) stand in Tiny Beaches, Tiny Township, Midhurst District.

Willow flea weevil, *Isochnus rufipes* (LeC.)

Adults emerge from hibernation in early June and feed, first on developing buds, and later on undersides of leaves. Females lay eggs during July, hatch occurs shortly thereafter and immediately young larvae begin maturation feeding. Pupation takes place in the mined leaves and adults emerge in August, feeding on remaining foliage until cool temperatures force them to seek shelter under loose bark and ground debris to overwinter.

This insect was abundant across Southern Region. High populations occurred at Cobden, Renfrew County, Pembroke District; and along Hwy. 7, east of Smith Falls, Lanark County, Kemptville District. Further south, willow flea weevil damage was prevalent on most willow (*Salix* spp.) in Aylmer, Guelph and Peterborough districts where all leaves were mined completely, resulting in foliage turning brown by the end of August (Figure 6.9).

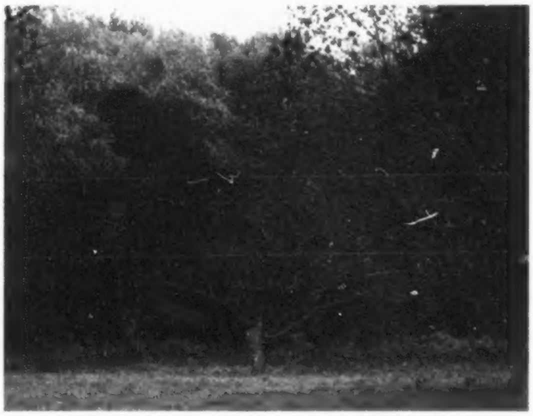
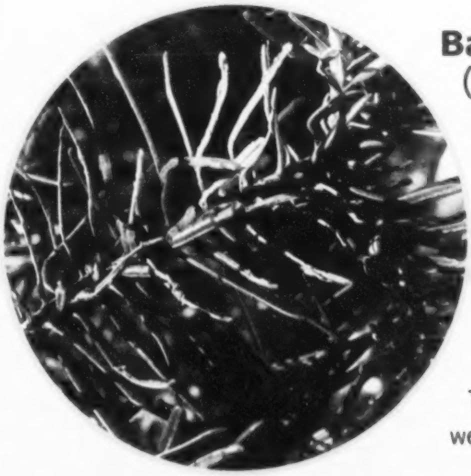


Figure 6.9 Defoliation and mining of willow flea weevil in Smith Falls, Kemptville District (photo by S. McGowan).

Eastern tent caterpillar, *Malacosoma americanum* (F.)

Most commonly found feeding on the foliage of cherry (*Prunus* spp.), eastern tent caterpillar has the potential to completely defoliate all preferred hosts. This early-feeding lepidopteran generally affects trees found in hedgerows and along the forest edge.

In 2009, eastern tent caterpillar was detected across Southern Region causing severe defoliation to individual trees in Aylmer, Guelph, Aurora and Midhurst districts with trace levels detected in Kemptville, Pembroke, Peterborough and Parry Sound districts.



Balsam fir sawfly, *Neodiprion abietis* (Harr.)

First reported in Canada in 1936, this sawfly overwinters in the egg stage, hatching between May and early July. Young balsam fir sawfly larvae (Figure 6.10) eat the outside edges of previous year's needles; causing a distinctive browning of the inner canopy.

Figure 6.10 Young balsam fir sawfly larval feeding (photo by S. McGowan).

Throughout Kemptville and Pembroke districts, collections were made on balsam fir (*Abies balsamea* (L.)) in historically infested areas near Cobden and Clay Bank in Renfrew County, Pembroke District. Further west in Peterborough District, this insect was collected along Hwy. 45 near Roseneath, Northumberland County and Hwy. 7 at Bethel Corners, Peterborough County.

Redheaded pine sawfly, *Neodiprion lecontei* (Fitch)

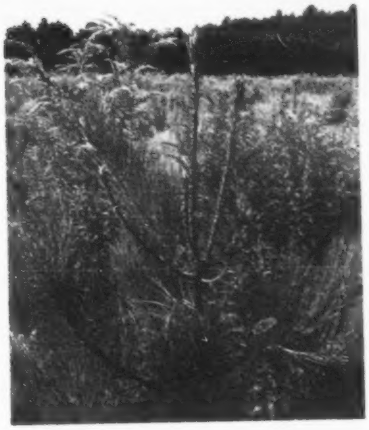


Figure 6.11 Redheaded pine sawfly defoliation on red pine. (photo by S. McGowan).

Adults of this major defoliator of pine plantations emerge in the spring, mate and lay eggs in June and July. Newly hatched larvae feed on previous year's needles, unless populations are high wherein all needles may be consumed (Figure 6.11). Once mature, larvae will drop and overwinter as prepupae in a cocoon spun within the duff layer of the soil.

Light defoliation was recorded at kilometer 39, Barron Canyon Road, Algonquin Park, Kemptville District on both red pine and jack pine (*P. banksiana* Lamb.). Additional infestations were detected on red pine at the Ferguson Forestry Centre and in plantations of the same host on Patterson's Corners Road, both in Oxford Township, Kemptville District.

Low populations were observed at Canadian Forces Base Borden, Midhurst District, where Lecontvirus, a species-specific nucleopolyhedrosis virus (NPV), has been used in previous years for control. Moderate populations containing significant numbers of deceased larvae were recorded on Will Johnson Road, in the city of Quinte West where natural occurrences of this same NPV may be responsible for the larval mortality.

White pine sawfly, *Neodiprion pinetum* (Nort.)

In Southern Region, colonies of white pine sawfly were detected feeding alongside introduced pine sawfly (*Diprion similis* (Htg.)) on eastern white pine (*Pinus strobus* L.) causing less than 10% defoliation west of Oastler Lake along Hwy. 69, Parry Sound District.

Spiny elm caterpillar, *Nymphalis antiopa* (L.)

This larva of the well-known mourningcloak butterfly (Figure 6.12) is commonly seen in Southern Region where white elm (*Ulmus americana* (L.)), willow, poplar (*Populus* spp.), and birch (*Betula* spp.) are preferred hosts. Larvae feed gregariously and disperse to pupate, overwintering as moths.

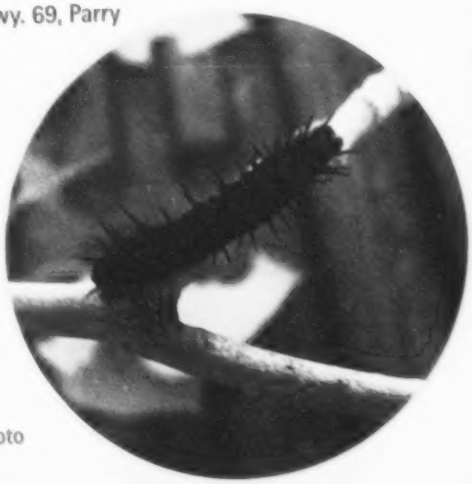


Figure 6.12 Spiny elm caterpillar larvae feeding on poplar (photo by S. McGowan).

Collections were made on poplar in both Guelph and Algonquin Park districts. In Peterborough District, white elm was affected and suffered moderate levels of defoliation.

Speckled green fruitworm, *Orthosia hibisci* (Gn.)

The larval stage of this general feeding lepidopteran was observed in late May feeding on open-grown black oak (*Quercus velutina* Lam.) near Bothwell, Aylmer District. Defoliation of host trees reached 15% at the time of observation, however feeding for this insect often continues into mid-July, when larvae drop to the soil to overwinter and pupate.

Spruce bud scale, *Physokermes piceae* (Schr.)

Often overlooked due to its remarkable resemblance to buds of spruce trees, this tiny insect can cause branch mortality during high population events. Female scales retain eggs within their body cavity, which hatch during May, allowing crawlers to move to new shoots to feed. As they feed, crawlers excrete honeydew that supports the development of sooty mould fungi, causing branches to appear black and aiding in the detection of this insect. Young scale insects often overwinter in clusters on terminal buds. When spring temperatures arrive, they resume feeding and complete their development.

In 2009, spruce bud scale was recorded as part of a complex of secondary pests that caused severe damage to a stressed plantation of Norway spruce (*P. abies* (L.) Karst.) at a cemetery north of Hagersville, Haldimand County, Guelph District. At this location, 75% of the mature Norway spruce were showing damage due to these pests and local environmental conditions.

Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.)

Young yellowhead spruce sawfly larvae hatch and begin feeding on current year's needles of spruce in May or June, sometimes dispersing to consume the previous year's foliage if required to reach maturity. This species shows a preference for young, open grown trees, making them more vulnerable to damage than understory trees and trees in mature, fully stocked stands.

High populations of this pest caused severe defoliation along the Hwy. 60 corridor from Whitney to the Visitor's Centre in Algonquin Provincial Park (Figure 6.13). Approximately 90% of juvenile roadside white spruce in this area suffered complete defoliation by mid-July.

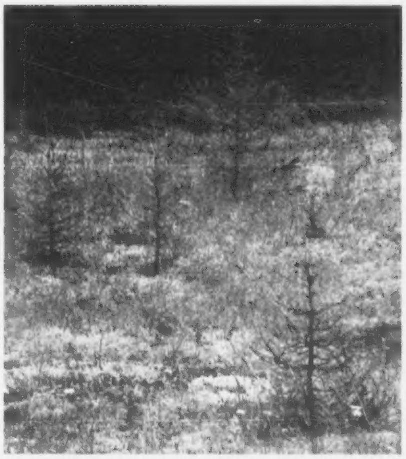


Figure 6.13 Yellowheaded spruce sawfly damage along Hwy. 60, Algonquin Park in July 2009. (photo by S. McGowan).

Poplar leafroller, *Pseudosciaphila duplex* (Wlsm.)

This early defoliator was present in moderate numbers on trembling aspen (*P. tremuloides* Michx.) along Hwy. 17 at Canadian Forces Base Petawawa in Pembroke District. Records indicate this location supports a recurring population, while a new infestation was also noted at Malakoff Road, Marlborough Township in Kemptville District.

Moderate defoliation by poplar leafroller was observed in Gloucester Township along Hwy. 417 east to Exit 96 and south of Ottawa along Airport Drive. In Oxford and Edwardsburgh townships, defoliation also reached the moderate level along Hwy. 416 south from Kemptville to Hwy. 401 in Kemptville District (Figure 6.14).

Flat leaftier, *Psilocorsis reflexella* Clem.

A large population of this leaftier was discovered in a 20 ha red oak stand causing low-to-moderate levels of defoliation, along Nursery Road, Simcoe County, Midhurst District. The preferred hosts of this lepidopteran species are oak, birch, maple and American beech..

Hickory bark beetle, *Scolytus quadrispinosus* Say

Considered to be the most destructive pest of hickory (*Carya* spp.) in North America, hickory bark beetle has caused large areas of decline and mortality in Aylmer and Guelph districts since 2001. Between 2001 and 2005, the area-within-which hickory bark beetle caused mortality and severe decline totalled 344,982 ha. Since then, the natural range of its preferred host, bitternut hickory (*Carya cordiformis* (Wangenh.)), has limited the spread of this insect.

Since 2006, no new extensions in the range of this insect have been recorded, although populations remain high within the original infested areas and host tree mortality is nearing 100% in most affected woodlots (Figure 6.15).

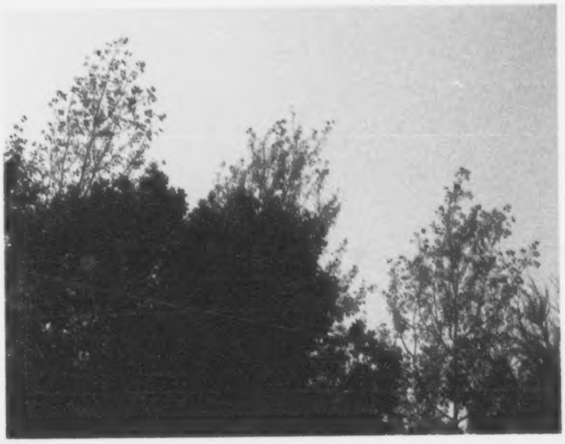


Figure 6.14 Defoliation by aspen leaf roller in Marlborough Township, Kemptville District in 2009 (photo by S. McGowan).

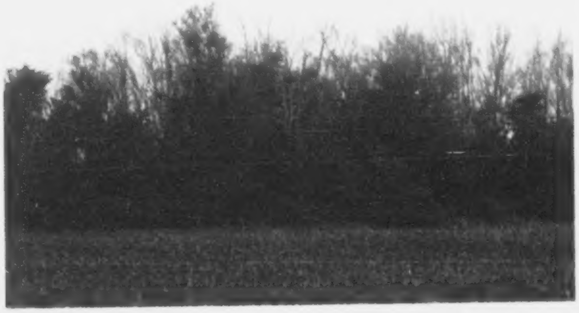


Figure 6.15 Hickory mortality north of Aylmer, Ontario (photo by E. Cleland).

Maple-basswood leafroller, *Sparganothis pettitana* (Rob.)

This common leafroller feeds primarily on hardwood hosts including maple and basswood, occasionally in large-scale epidemics.

Eggs of this species hatch in early spring and larvae feed in expanding buds until leaves are fully formed. At this time, larvae loosely roll host leaves and emerge to feed on nearby foliage. Full-grown larvae create a purse-like pupal chamber in the protection of the rolled leaf, emerging as adult moths between late June and early August.

This insect was found causing light defoliation to mature basswood trees in Brigden Crown Game Preserve, Lambton County, Aylmer District.

FOREST DISEASES

Linden leaf-blotch, *Didymosphaeria petrakiana* Sacc.

This leaf disease of basswood developed across the eastern portion of Midhurst District, causing severe early-leaf drop on most basswood by early September, 2009. Affected foliage was noted in many locations from Orangeville, Dufferin County north to Collingwood, Simcoe County and eastward to the Midhurst/Bancroft District border.

Anthracnose, *Gnomoniella fraxini* Redlin & Stack, *Discula quercina* (Cooke) Sacc.

For the past several years, anthracnose has been a common disease affecting many species of hardwoods across Southern Region. Due to a cool, wet start to the growing season, several species of anthracnose were recorded in 2009.

In early June, two separate species of anthracnose were seen affecting ash and oak trees. Ash trees were affected by Gnomoniella fraxini and oak trees were affected by Discula quercina. The affected trees experienced sudden leaf drop from the lower and mid crown due to these fungal infections. The affected trees refoliated by July (Figure 6.16).

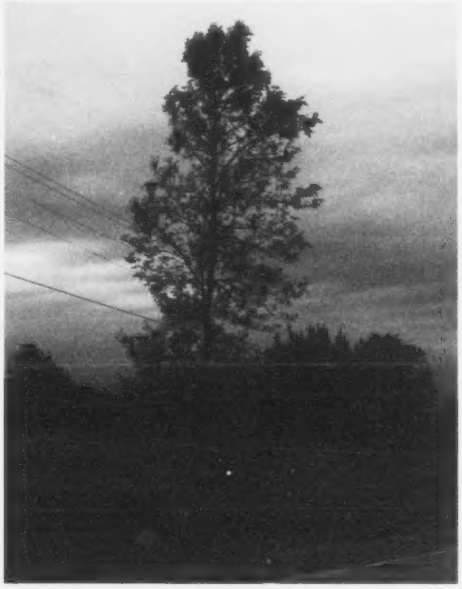


Figure 6.16 Ash anthracnose in the Brockville area (photo by S. McGowan).

Cedar-apple rust, *Gymnosporangium juniperavirginianae* Schwein.

The striking fruiting bodies of this native disease were prevalent on eastern red cedar (*Juniperus virginiana* L.) colonizing abandoned farmland along Hwy. 3, west of Wallacetown, Elgin County, Aylmer District. Fruiting bodies were evident immediately following a significant rain event in late May 2009. The causal pathogen of this disease requires a second host, apple (*Malus* spp.), to complete its two-year life cycle.

During high humidity and rainfall events the gelatinous fruiting bodies found on eastern red cedar release their spores. While free standing water is still available, these spores infect nearby apple and crab apple trees. Over the course of the growing season these initially-infected areas become lesions on leaves, twigs and fruit of the host apple tree and by late summer form cup-like structures. Sporulation occurs from these cups and nearby red cedar hosts may be infected into the autumn months. The disease overwinters in this stage, with these infection points causing small galls the following spring. In order to complete the two-year lifecycle, these galls remain on cedar hosts for an entire summer swelling into conspicuous, orange fruiting bodies the next spring and re-infecting nearby apple trees again (Figure 6.17).

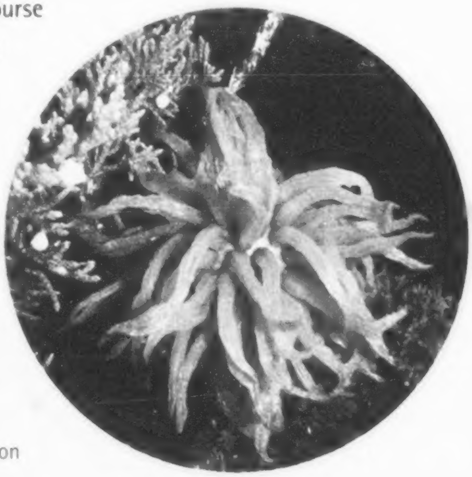


Figure 6.17 Bright orange telial horns of cedar-apple rust on eastern red cedar (photo by E. Cleland).

Fomes root rot, *Heterobasidium annosum* (Fr.:Fr.) Bref.

Historically this disease has been monitored in Kemptville District at Larose Forest in Prescott and Russell County and at Limerick forest in Leeds and Grenville County. This year, several new pockets of tree mortality were due to fomes infection while in each of the established pockets, continued mortality of red pine (*Pinus resinosa* Ait.) trees occurred.

With the cool wet weather the Southern Region experienced, fruiting bodies were abundant in 2009, a visual indicator of the presence of this root disease.

Marssonina leaf spot, *Marssonina brunnea* (Ell. & Ev.) Magnus

This fungal disease of poplars was evident throughout the Kemptville, Pembroke and Algonquin Park districts this season, favoured by the cool and wet weather of 2009. The largest area observed was at Hunt Club and Davidson Road in Ottawa, Kemptville District, where a 2 ha poplar plantation was defoliated (Figure 6. 18).

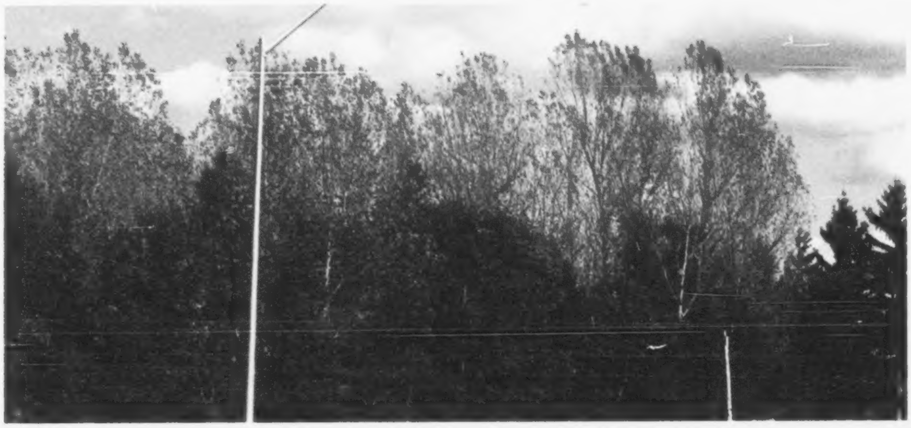


Figure 6.18 Marssonina Leafspot on poplar (photo by S. McGowan).

Conifer-aspen rust, *Melampsora medusae* Thüm.

Many fungal diseases developed as a result of the cool, wet summer that occurred in Southern Region this year. Conifer-aspen rust was detected on poplar throughout Midhurst and Aurora districts. This disease occurred late in the season and therefore caused minimal damage to growth and vigour of affected host trees.

Brown spot needle blight, *Mycosphearella dearnessii* M.E. Barr

In Southern Region, this disease of pines was recorded in three districts in 2009 with a total of 111 ha affected.

In Parry Sound District a 37 ha Scots pine plantation had moderate-to-severe levels of the disease. This plantation was located north of Beatrice on either side of Hwy. 11 and along the southern shore of Sparrow Lake, Morrison Township, Parry Sound District.

In Midhurst District, 74 ha of affected Scots pine plantations were recorded northeast of Wyevale, south of Midland and west of Hwy. 93, Tiny Township (Figure 6.19). In addition, lophodermium needle cast (*Lophodermium seditiosum* Minter, Staley & Millar) was also identified within collected samples as a secondary disease.

Trace levels of brown spot needle blight were also detected in Peterborough District on the same species affecting 100% of the trees in a Scots pine plantation within the city of Quinte West, Northumberland County.

Septoria leafspot, *Septoria betulae* Pass.

Moderate damage on white birch (*Betula papyrifera* Marsh.) was recorded for 12 km along Barron Canyon Road, Master Township at the east boundary of Algonquin Provincial Park. Further damage was also observed at multiple locations throughout Kemptville and Pembroke districts.

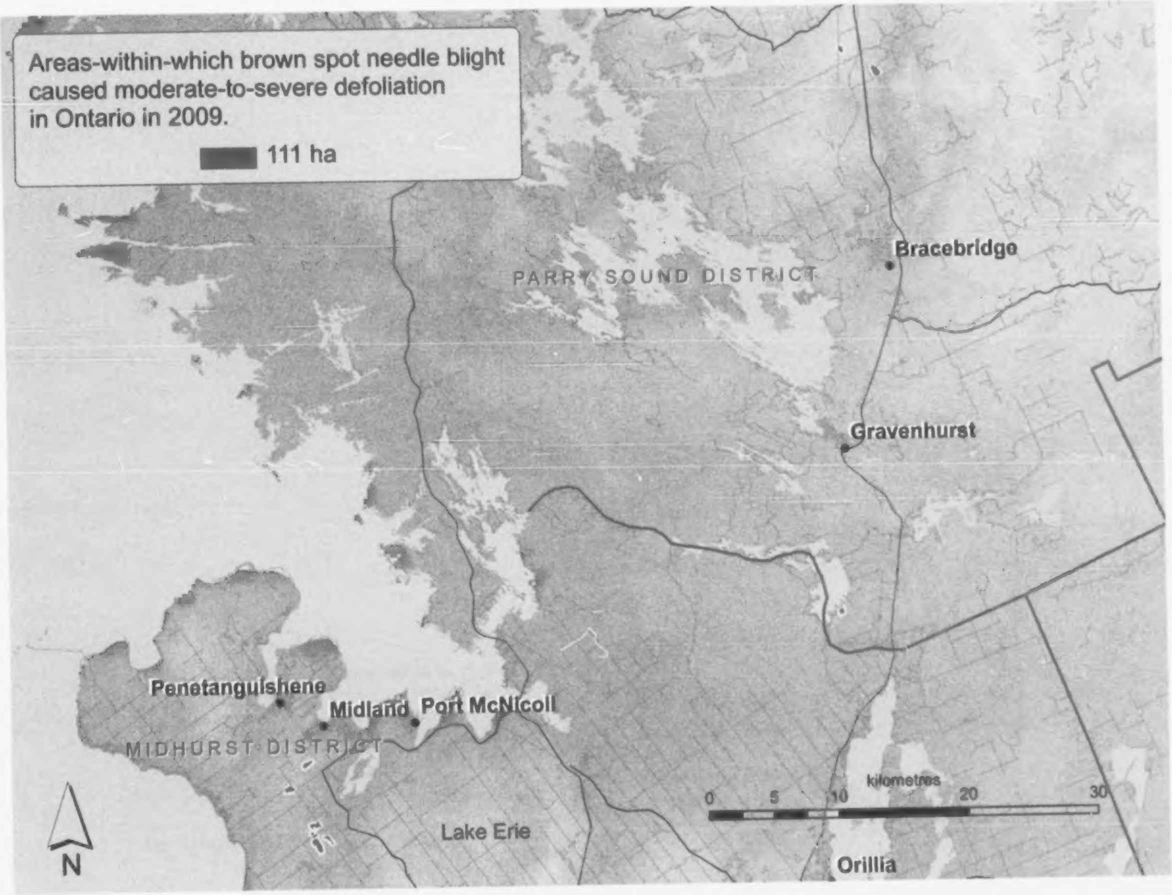

Areas-within-which brown spot needle blight caused moderate-to-severe defoliation in Ontario in 2009.
▇ 111 ha
PARRY SOUND DISTRICT
Bracebridge
Gravenhurst
Penetanguishene
Midland
Port McNicoll
MIDHURST DISTRICT
Lake Erie
Orillia
kilometres
0
5
10
20
30
N

Figure 6.19 Areas-within-which brown spot needle blight cause moderate-to-severe damage in Ontario in 2009

Septoria leaf blight, *Septoria musiva* Peck

Adding to the array of fungal diseases recorded in 2009, septoria leaf blight was noted across Midhurst District and in the northern portion of Aurora District. While most poplar species are somewhat susceptible to this disease, balsam poplar (*P. balsamifera* L.) and trembling aspen were heavily diseased causing severe browning of foliage and in most cases early leaf drop.

Diplodia tip blight, *Sphaeropsis sapinea* (Fr.) Dyko & B. Sutton

This common tip blight was encountered throughout Southern Region in 2009, primarily infecting roadside and urban plantings of red pine. Most trees exhibited typical symptoms of light infection including stunting and browning of current year's needles and in a few severe cases branch mortality.

FOREST ABIOTIC EVENTS

Ash decline

In 2009, declining ash trees were observed across southwestern Ontario, including several areas outside of known infestations of the invasive pest, emerald ash borer (*Agrilus planipennis* Fairmaire). This decline was in the form of branch and top mortality as well as whole-tree mortality (Figure 6.20).

Decline was recorded in the St. Thomas area, Elgin County, Aylmer District northward through Middlesex County, west of the City of London and continuing into the west end of Huron County, Guelph District between Grand Bend and Goderich. Additional areas with declining ash trees included the counties of Oxford, Norfolk and Haldimand, as well as Niagara Regional Municipality. The most common species showing signs or symptoms of stress was white ash, although most species of ash were noted in decline within the affected municipalities.

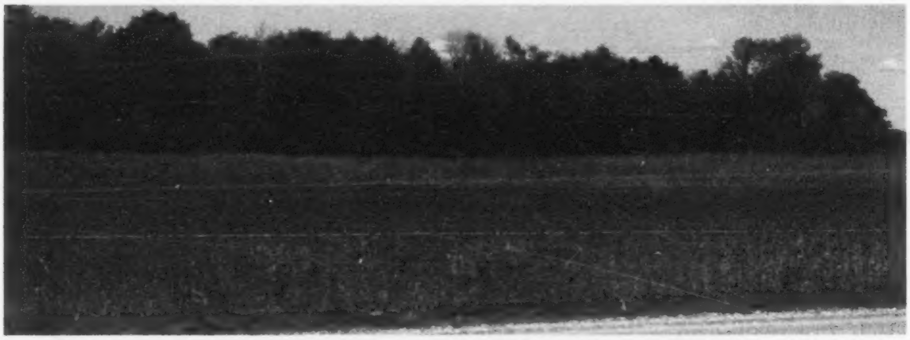


Figure 6.20 Ash decline in Huron County woodlot (photo by E. Cleland).

During aerial surveys for emerald ash borer damage, multiple stands with severe ash decline were recorded. Subsequent ground verification delineated 3,602 ha of woodlands with declining ash trees that were not associated with EAB activity (Figure 6.21).

The primary reason for this decline is not entirely understood but several influencing factors were noted during ground verification. These factors may include previous drought damage, ash yellows, excessive flooding during the growing season, and secondary insect and disease pests such as eastern ash bark beetle and armillaria root rot (*Armillaria* spp.).

Frost Damage

Two separate frost events in May 2009 caused foliar damage to a variety of hardwood trees which had already flushed. Tender, developing shoots were killed on butternut (*Juglans cinerea* L.), black walnut, cucumber-tree (*Magnolia acuminata* L.), tulip-tree (*Liriodendron tulipifera* L.), eastern flowering dogwood (*Cornus florida* L.) and a variety of oak and hickory trees. The level of damage varied across the region. Some localized pockets were more severely affected, however ample spring rains enabled affected trees to refoliate in short order.

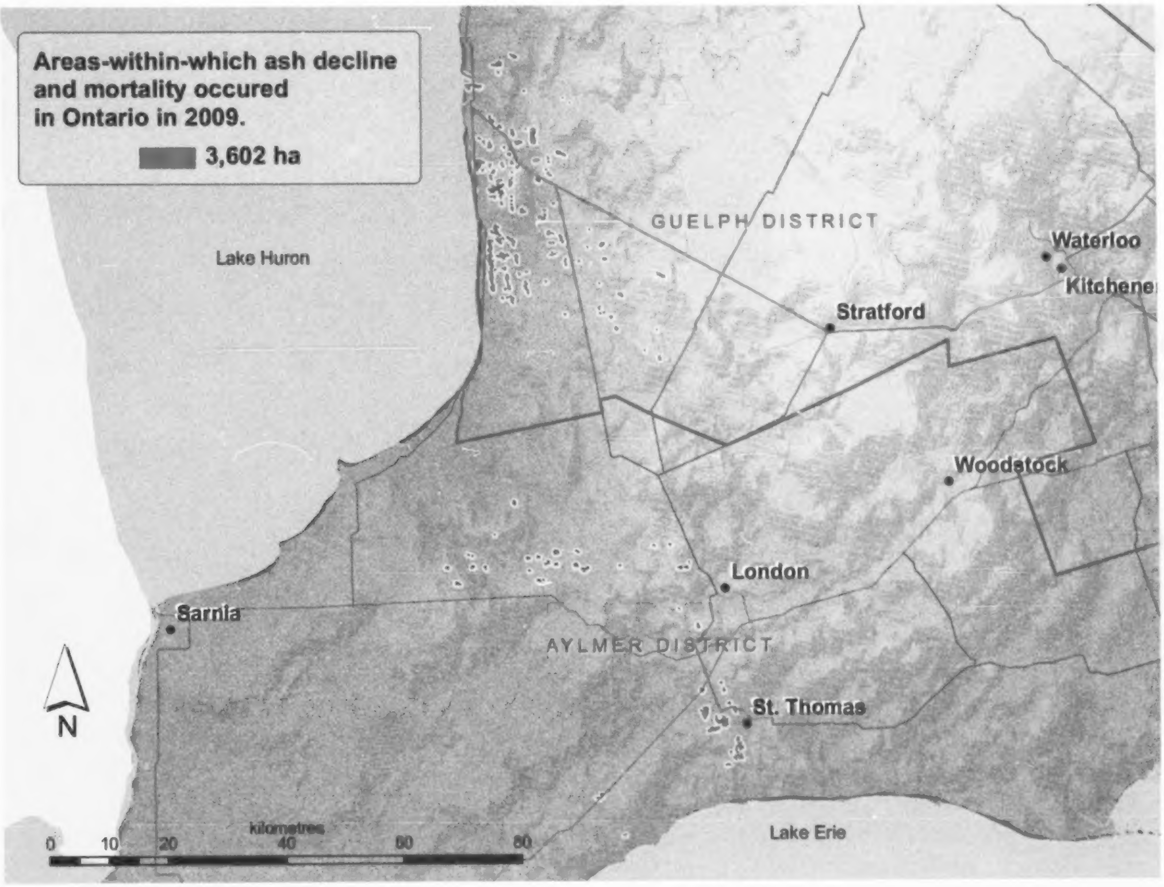

Areas-within-which ash decline and mortality occured in Ontario in 2009.
3,602 ha
Lake Huron
GUELPH DISTRICT
Waterloo
Kitchene
Stratford
Woodstock
London
Sarnia
AYLMER DISTRICT
St. Thomas
N
kilometres
0
10
20
40
60
80
Lake Erie

Figure 6.21 Areas-within-which ash decline and mortality occurred in Ontario in 2009.

Scorch

After a cool wet spring in 2009, a sudden increase in very high temperatures occurred in late August causing scorch damage on young roadside sugar maple (Figure 6.22) growing along the shoreline of Bobs Lake, Frontenac County, Peterborough District. Sugar maple suffers from increased susceptibility to scorch due to their thin leaf structure.

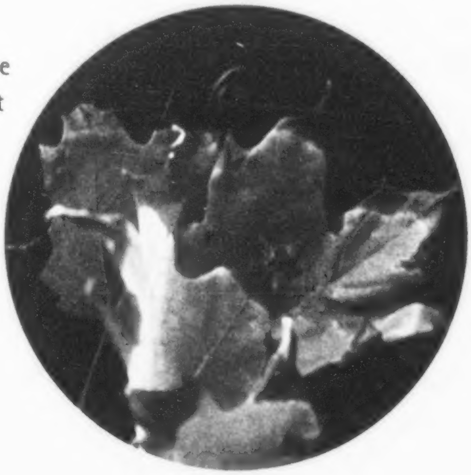


Figure 6.22 Scorch on sugar maple caused by extreme heat and drying (photo by S. McGowan).

Snow Damage

Heavy wet snowfall in November, 2008 caused severe damage to red pine, Scots pine, jack pine and eastern white cedar stands in southern Ontario. Many individual hardwood species were also affected.

Within days of one another, record-breaking high temperatures and long lasting sunny periods were followed by heavy snowfalls and light rains. This weather pattern occurred from November 16th to November 22nd, causing some of the most severe weather damage to coniferous plantations ever recorded in Simcoe County, Midhurst District.

A total of 730 ha of severe damage were recorded by aerial surveys in Springwater, Oro-Medonte, Ty, and Tay townships and in small pockets within the town of Barrie and near Penetanguishene areas (Figure 6.23).

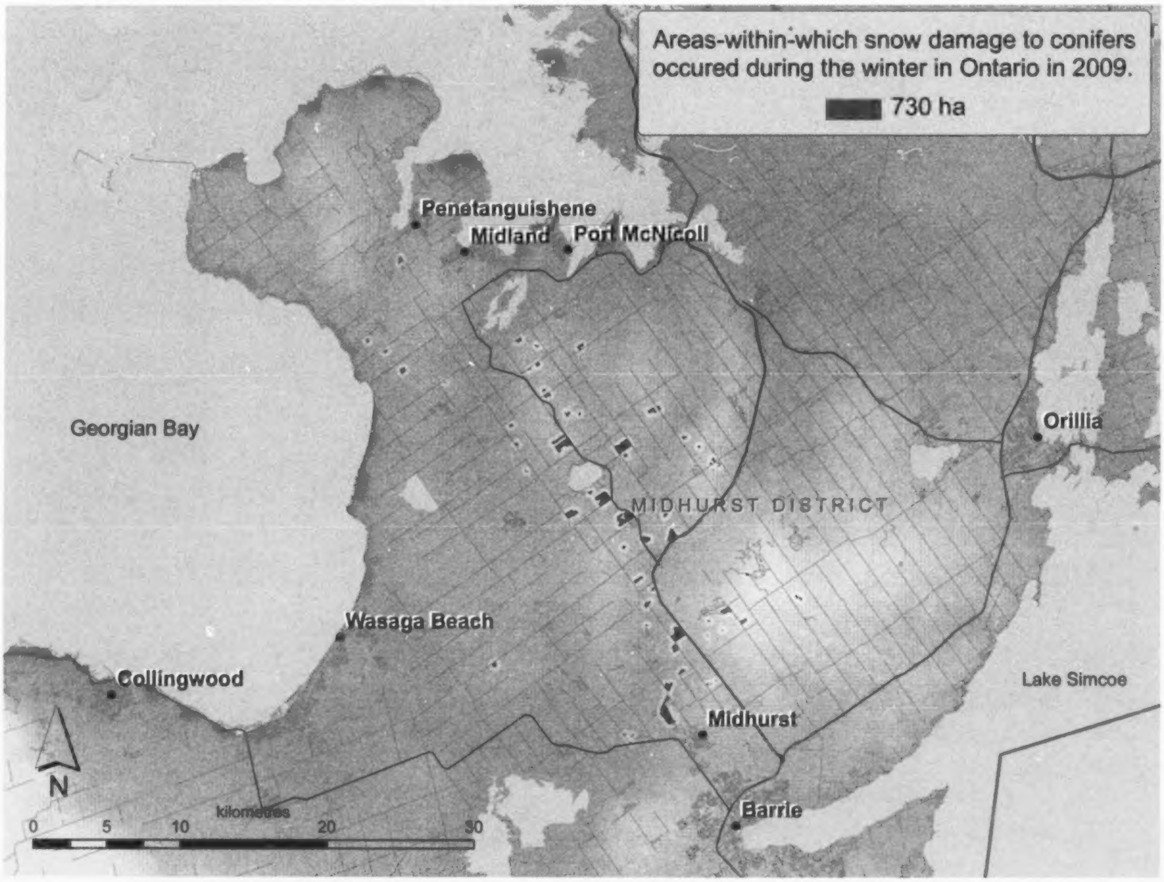

Areas-within-which snow damage to conifers occured during the winter in Ontario in 2009.
■ 730 ha
Penetanguishene
Midland
Port McNicoll
Georgian Bay
Orillia
MIDHURST DISTRICT
Wasaga Beach
Collingwood
Lake Simcoe
Midhurst
Barrie
N
kilometres
0
5
10
20
30

Figure 6.23 Areas-within-which snow damage to conifers occurred during the winter of 2008-2009 in Ontario.

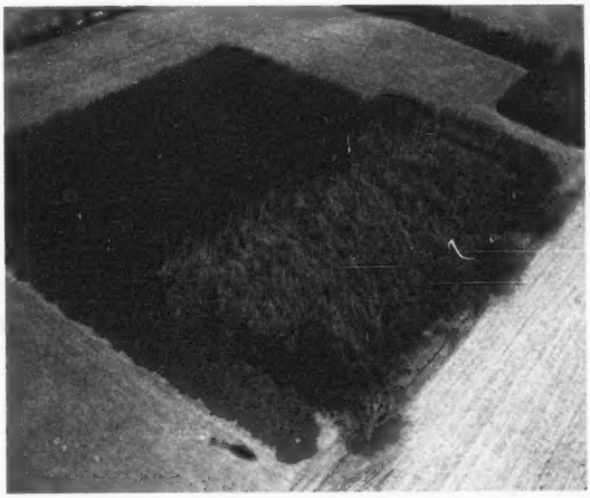


Figure 6.24 Snow damaged red pine and eastern white cedar stands from November, 2008 snowfall. (Note: white spruce and eastern white pine not damaged) (photo by P. Hodge).

Red pine plantations were most affected (Figure 6.24) as snow accumulated on the sturdy branches eventually forcing trees to bend over onto neighbouring trees. Within the plantations trees were snapped, bent over, or uprooted resulting in severe damage (Figure 6.25).

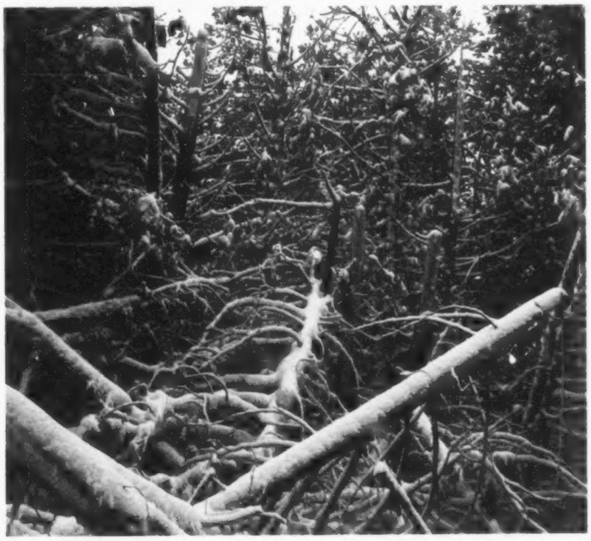


Figure 6.25 Severe snow damaged red pine, Simcoe County, November 2008 (photo by P. Hodge).

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